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JAPANESE TECHNOLOGICAL ADVANCES AND POSSIBLE UNITED STATES RESPONSES USING RESEARCH JOINT VENTURES

HEARINGS

BEFORE THE

SUBCOMMITTEE ON
INVESTIGATIONS AND OVERSIGHT

AND THE

SUBCOMMITTEE ON
SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

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SCIENCE AND TECHNOLOGY
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JAPANESE TECHNOLOGICAL ADVANCES AND POSSIBLE U.S. RESPONSES USING RESEARCH JOINT VENTURES

WEDNESDAY, JUNE 29, 1983

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT AND THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,

Washington, D.C.

The subcommittees met, pursuant to call, at 9:30 a.m., in room 2325, Rayburn House Office Building, Hon. Albert Gore, Jr. (chairman of the Subcommittee on Investigations and Oversight) and Hon. Doug Walgren (chairman of the Subcommittee on Science, Research and Technology) presiding jointly.

Members present: Hon. Buddy MacKay, Hon. Harry Reid, Hon. Claudine Schneider, Hon. Mervyn Dymally, and Hon. Joe Skeen.

Mr. GORE. The subcommittees will come to order.

I would like to welcome our distinguished witnesses and our guests to this hearing. We feel that it is likely to be an extremely interesting and valuable hearing. This is the first of 2 days.

In 1980, Japan's Ministry of International Trade and Industry [MITI] issued its visions of the 1980's. This roadmap for industrial policy foresees Japan's industry becoming technology based by 1990.

Since MITI's announcement, Japan's industry has embarked on major programs to develop new technologies in a number of areas emphasizing such areas as high-speed computers, artificial intelligence computers, and biotechnology. In semiconductors, Japan's firms now account for 70 percent of worldwide sales of 64K RAM microchip technology. Whereas in 1978, Japan's microchip sales accounted for only 13 percent of the worldwide microchip market.

Those who have looked at Japan's postwar technological success cannot help but feel admiration. Nevertheless, as Japan's share of world trade and high technology items has tripled since 1962, the U.S. share has, during this same time, decreased by almost 30 percent. Accordingly, whatever admiration we feel for Japan's industrial success must be tempered by alarm over our own declining position in the world high-technology community.

In many cases, individual Japanese companies will spearhead the move to new technologies. In other instances, however, breakthroughs will be the product of collective research, partially underwritten by the Japanese Government. As seen by some experts, such research projects are often the product of difficult national debates among representatives of many diverse industries. The results of such consensus taking are then translated into national efforts such as the 10-year governmentally supported artificial intelligence or fifth generation ICOT computer project now budgeted at $450 million. It is with a view toward learning more about how the Japanese Government and industry have organized to develop these large-scale governmentally supported programs that these two subcommittees are holding these hearings.

The stakes, we feel, are high; the need for success evident. We are interested in learning from Japan's success and from our other working competitors and developing institutions which will help the United States maintain its relative edge.

Of course, in 2 days we cannot possibly hope to examine fully the depth of how Japan has achieved technological excellence in so short a period of time. However, unless we make the effort to evaluate what the countries such as Japan have done to achieve technological success, we may not find cures for a number of problems that now plague development of technology in the United States.

Further, if parts of Japan's technological success can be attributed to joint research efforts, we should try to find out what those parts are so as to fashion a U.S. reply.

In the electronics industry, U.S. companies have already begun to form research joint ventures. Today we will hear from representatives of those ventures.

In addition to testimony on Japan's joint research and appropriate U.S. responses, the subcommittees will also hear testimony principally to learn from legal experts on how the United States antitrust laws affect the formation of research joint ventures. We have often heard comments that the U.S. antitrust laws exert a chilling effect on research joint ventures. Yet, no case has been brought to the attention of the subcommittees in which a research joint venture was overturned on antitrust grounds.

We must get to the bottom of this riddle and find out whether there really is a problem or whether, as is so often the case, the Nation's antitrust laws are being used as an excuse for other problems.

Tomorrow's testimony will focus in detail on this issue.

In summary, there are several areas of understanding we hope to obtain from these hearings. They are as follows:

No. 1, to what degree is Japan's success attributable to Government-sponsored research joint ventures?

No. 2, how extensive is the Japanese Government's involvement in such ventures and what industries are affected?

No. 3, are there other factors which contribute to Japan's technological success and which, joint research notwithstanding, constitute the real challenge to U.S. industry?

No. 4, is there a willingness in this country to engage in research joint ventures and if so, does such interest extend to all industries or just a select few?

No. 5, to what degree are this Nation's antitrust laws an impediment to the formation of research joint ventures?

I am pleased now to call on my cochairman for these hearings, Congressman Doug Walgren.

Mr. **Walgren**. As chairman of the Subcommittee on Science, Research and Technology, we are particularly pleased to welcome you here today and to join in these hearings on the subject of how the Japanese have organized their industrial strength to succeed in the international economic competition that we are all involved in.

There was real concern on this Nation's once-unchallenged role as No. 1 in commercial and science and technological innovation and it is being more than threatened by competitors around the world and especially Japan. That has prompted a call for an effective and unified U.S. response.

This whole circumstance is made more difficult by in some instances either unfair, or in certain instances, I think on their face, illegal foreign trade practices engaged by some parts of the Japanese economy.

Yesterday on nationwide television another subcommittee of the Congress screened tapes of an FBI operation which clearly involved illegal activities by representatives of a Japanese corporation procuring U.S. technology that was still private.

I honestly hope that the knowledge that we might be able to develop through this kind of a hearing will help us sort of maintain our balance and enable us to have better judgment about what we have to do as a nation and prevent us from perhaps responding to that kind of individual instance in the wrong way and help us to have a more constructive response in the whole area of Japanese-American economic relations.

During these 2 days of hearings we hope to obtain a better understanding of how, the Japanese in particular, have succeeded. The hearings will focus on Japanese industrial research policy, particularly the effect of government industry coordination and we will give special attention to the role of joint ventures in research by Japanese firms and what the response has been on the United States side.

As Mr. Gore outlined today's witnesses will include representatives from industries most affected by the Japanese challenge, particularly electronics and computers and we hope that these witnesses will be able to give us and those who look to the testimony presented in congressional hearings a better insight on the effects of Japanese joint research on their industries and what we can suggest as an appropriate response.

I am particularly pleased to have Admiral Inman here who represents the Microelectronics and Computer Technology Corp. which has gotten widespread recognition in our press and our business community as the newest U.S. research joint venture.

The second day of hearings will center on administrative approaches to joint research ventures and will include a panel of Justice and Commerce Department officials from both the last and the present administrations.

In addition, we hope to have a panel of lawyers and legal scholars who will discuss the pro's and con's of revising the present antitrust laws in an effort to encourage U.S. companies to engage in cooperative research and development ventures.

Then on July 12 the Subcommittee on Science, Research and Technology will have a hearing on H.R. 1952 which is titled, the Joint Research and Development Ventures Act, jointly referred to the Science and Technology Committee and to the Judiciary Committee. In this hearing we will address that proposed legislation and its effectiveness in dealing with these problems and if other bills in that area are referred to the subcommittee, they will be considered at that hearing as well.

On behalf of my side of the two subcommittees, we certainly want to welcome you and express our appreciation for the contributions that you will make to these hearings.

Thank you, Mr. Chairman.

Mr. GORE. Thank you, Congressman.

Congressman Joe Skeen, ranking minority member of the Investigations Subcommittee.

Mr. SKEEN. Thank you, Mr. Chairman.

I have no prepared statement but I would like to contribute a little observation in this regard. We have had a lot of hearings relative to this particular topic, in this Committee, and it brings to mind a conversation I had with a Japanese friend who is in the automobile business in New Mexico, And he said: "You know, it is a strange thing, we Japanese learn to make automobiles as we collected a lot of your technology. We have benefited greatly by it because we organized it in a good Japanese way but now we have made the teacher cry." And I, for one, think it is time that the teacher quit crying and faced up directly to the problem that we have in the world today that it is a much smaller world than it was some 20 or 30 years ago. Technology moves very rapidly through all the channels and there are those who can benefit by it, particularly those of us in the United States if we will quit crying and become rather than teacher-student relationships, partners or more innovative and I don't think that anybody in the United States and we have one of our greatest elements of our character is we are innovative.

So, I want to compliment you, Mr. Chairman, on the hearings that we are going to have today and the panels that you have assembled and welcome those who will testify with the idea that we are going to take an initiative here. I think Secretary Baldrige is before the Senate Judiciary Committee today discussing the legal possibilities in connection with this kind of a partnership with a Japanese nation and with other nations in regard to the antitrust provisions and what this Department thinks and counsels them on this particular undertaking. So, I compliment both of you, Chairmen, for the joint hearing and welcome the guests. And, thank you very much.

Mr. GORE. Thank you.

Let's get right into our first panel.

Let me note, however, that there is a change in the order of witnesses and Mr. Erich Bloch, vice president of IBM and chairman of the Semiconductor Research Corp. will be joining the first panel and Mr. Joji Arai, a director of the Japan Productivity Center will be joining the second panel. Our other witnesses on the first panel include Adm. Bobby R. Inman, president of the MCC Corp., Dr. Harvey Brooks from Harvard University, and Mr. John Lacey of technology and planning with Control Data Corp.

Admiral Inman, we would like to begin with you and let me just note for the record that I have certainly enjoyed the opportunity to have a working relationship with you on the Intelligence Committee for the past several years and a lot of people are excited about your role in this effort and I notice where Newsweek magazine gave you a brandnew title to go along with all the others you have earned, the Super Computer Czar.

So, I can think of no more appropriate witness to lead off these hearings and without objection your prepared text will be put into the record and we are cognizant of the fact that you are scheduled to testify before the Senate Judiciary Committee my colleague referred to, so we will get you out of here in time for you to make that appearance.

Please proceed with whatever portion of your prepared statement you care to present.

STATEMENT OF ADM. BOBBY R. INMAN, PRESIDENT, MCC CORP.

Admiral INMAN. Thank you, Mr. Chairman. After those kind remarks, my first flash memory was of Dennis Healey, who has said: When you find yourself in a hole, stop digging. I will file my statement for the record and all of you have had a chance to read about MCC, how it has been formed and what it is set up to do.

If I may move a little distance away from my prepared remarks inspired by the remarks of three Members as we begin, it is a pleasure for me to be back sitting with the two committees, since I last was with the two of you in March of 1982 talking about technology transfer. Now, I am dealing with it in a different way. But it has been a wonderful year of discovery for me, discovering my own country after 30 years of looking at the outside world, a chance to look at the general status of a lot of businesses before settling on the job, to undertake this one.

One of the most striking discoveries of the year that I should already have in full focus was the general state of graduate science, the limited number of computer scientists and mathematicians available to this country at this juncture in our history to take advantage of the wonderful economic opportunities out ahead of us. When one looks back at the end of World War II we fueled that great economic boom first by the GI bill and second by grants, largely from the Defense Department for doctoral studies with no strings attached.

The 1980's for a variety of reasons, cost-effectiveness and paying the bill in Vietnam we reduced the investment in defense in basic research and we stopped those unlimited grants and you can chart the figures from the time of that decision in 1964 or 1965 to the beginning drop in the number of U.S. graduate students in 1968.

We are now at a time in 1980 as we look at the great opportunities we see, particularly in this information handling industry, for booming economic opportunity, booming jobs in this country if we get out there and work at keeping the lead in order to have those jobs created in this country. We find a shortage of talent to undertake the challenge and unless we can find ways to focus that talent to insure that we are not having the talent we are producing spread across a large number of industries recreating the same basic technology, we are going to have great difficulty in standing at the lead edge of that burgeoning business.

I think that is the lesson to be learned in looking at the Japanese efforts. I prefer to look at it as though we should thank them for focusing our attention on the value of R&D which is clearly focused on objectives you want to achieve and that bring substantial talent to do it.

I think we have our own unique approach to doing that. It does not have to be Government funded but it does have to be Government supported. My experience in these limited months tells me that there are a number of areas where this could be improved.

May I stop at that point. MCC has now 12 formal and will soon announce a 13th member. There are a number of other companies that have expressed interest in the concept as it was being formed, and who are now in dialogue. It was very carefully structured and combined with the emphasis from the outset on how does one move technology that is developed quickly to the production lines of the sponsors but after a relatively short delay how do you also make that available to other U.S. companies to try to improve the overall competitive position of the country. It also is focused on long-range research, not on short-term, and the shortest duration project we have is 6 years and may run out to 10.

So, we really are talking here about a group of companies that have gathered not to focus on what they are going to market in the next several years but indeed to follow the Japanese model and to put together a collaborative effort in the private sector that focuses on what we ought to be producing and taking to the marketplace 6 to 10 years from now.

Thank you very much.

[The prepared statement of Admiral Inman follows:]

PREPARED STATEMENT OF ADM. B. R. INMAN, MICROELECTRONICS AND COMPUTER TECHNOLOGY CORP.

The "Microelectronics and Computer Technology Corporation," (MCC), is a research and development venture owned by a number of companies in the United States computer, electronic and semiconductor industries. Participating companies so far include Advanced Micro Devices, Allied Corporation, Control Data, Digital Equipment Corporation, Harris, Honeywell, Martin Marietta, Mostek, Motorola, National Semiconductor, NCR, RCA, and Sperry.

The mission of MCC is to provide cooperative research and applied technology, to make the most of our scarce human and capital resources --- to preserve the United States competitive position in the microelectronics and computer industries --- and to foster competition as each participant uses the results of MCC research to derive products of its own conception for markets of its own choice.

MCC will develop a broad base of fundamental technologies and undertake projects that will go significantly beyond current state-of-the-art. Development will zero-in on areas where the investment is so large, or the risk so great, or the critical skills so short --- that a shared effort is the only practical approach.

Four initial programs have been identified for MCC research ... advanced computer architecture ... computer aided design and manufacturing ... system and circuit chip packaging ... and software technology.

Each of them is long-range, complex and intended to achieve a significant forward leap in the technology. Preliminary definitions of the technical objectives, work to be accomplished, costs and schedules for each technology program have been completed by task forces of personnel from participating companies. Other programs will be added as the needs dictate.

MCC projects will be staffed to a considerable extent by personnel "loaned" from shareholder companies. This flow of talent to and from shareholder companies will be key to the success of MCC programs. This process greatly facilitates the transfer of technologies to participating companies.

The benefits to MCC shareholder companies include:

- An expanded scope of R&D to include projects that individual companies could not or would not undertake alone due to the costs and risks involved;
- A reduction in the wasteful duplication of R&D;
- A better definition of R&D needs and pitfalls; and
- A more efficient utilization of scarce scientific and technical talent.

For convenience, MCC will hold title to all know-how and patents. Although participating companies will have initial rights to the technology and receive preferential treatment, the technology will be licensed to other companies on reasonable terms. This is extremely important for example to small companies -- a major source of innovation and job creation.

MCC, therefore, will become a significant national technology resource. Each shareholder or licensee of MCC will draw upon its fundamental technologies, add value, and compete in markets of its own choosing with products and services of its own design. The ultimate beneficiary of this process is the whole country through increased job opportunities and the expansion in the choice of products and services available to individual consumers.

Microelectronics and computers in twenty-five short years have moved from a speciality to a necessity in the emerging information age. What steel and power were to industrial America, microcomputers are to knowledge-based America. Jobs, profits, the balance of payments and the national defense are profoundly affected by the rise and fall in the fortunes of the microelectronics and computer industries. These industries are gripped with a multiplicity of threats, internally by shortages of capital, skilled personnel and time --- and externally by government supported campaigns from Japan and Europe to replace America as the world leader in microelectronics and computers.

MCC is a unique --- made-in-America response --- a private sector initiative --- a means to avoid wastefull duplication of R&D among the high technology firms in the industry --- a tool to enhance competition and our quality of life.

Mr. GORE. Thank you very much. We are going to try to get through the other witnesses on the panel and then focus our first questions on your testimony, but we would like to hear from the other witnesses first.

Dr. Harvey Brooks from Harvard University, we are delighted to have you here and if you care to summarize any portion of your prepared statement and be assured that the full text will be included in the record at this point.

STATEMENT OF HARVEY BROOKS, HARVARD UNIVERSITY

Dr. BROOKS. Thank you, Mr. Chairman. I come to this from a somewhat different background than the other members of this panel and my observations perhaps will be fairly general but I think they are important to bear in mind.

First of all, it would be wrong to ascribe Japanese competitive success in high technology to research and development alone or to expect that the U.S. lag can be overcome by working exclusively on the R&D component of the process in isolation from other aspects.

The United States still has the largest and most diversified R&D establishment in the world and we still lead the world in the creation of industrial innovations though not in their successful commercialization.

Some observers believe that the Japanese derived much greater commercial payoff from their R&D dollars than does the United States. Prof. Gene Gregory, an American management professor teaching in Japan suggests that based on patents and other innovation measures, the Japanese get 6 times as much from their R&D dollar as we do. Whether that is true or not is hard to say because patent statistics are a notoriously poor measure of innovation. But one possible source of Japanese research productivity is the avoidance of wasteful and inefficient competition in R&D, a subject that I will come back to in a moment.

There is quite general agreement that a major element of Japanese success lies on the production and manufacturing side, not only in manufacturing technology but perhaps even more in the organization of production and the management of the manufacturing work force. Recent studies have indicated also that the effective cost of capital for manufacturing in Japan may be nearly 5 times lower than in the United States.

Another major element in Japanese success has been skill in exploiting learning curves and economies of scale. Their success in exports has fed on itself, enabling Japan, starting from the existing state of the art to traverse the learning curve much more rapidly than its competitors, thus achieving progressively greater cost advantages as the market expanded and generating more surplus to feed back into product and process innovation which further reinforced the advantage.

Although Japan's success in recent years has been based on the adaptation of Western, mainly American technology and the capacity to commercialize it more rapidly than its competitors it would be very wrong to conclude from this that the Japanese are mere imitators who, once they have attained the world state of the art in a field will not continue to move forward the frontier of technology. On the contrary, history suggests that imitation followed by more and more innovative adaptation leading eventually to pioneering creative innovation forms the natural sequence of economic and industrial development which Japan has been traversing. Successful imitation far from being symptomatic of lack of originality as used to be thought is the first step of learning to be creative. This is probably true of nations as well as individuals, something which Americans may have forgotten with our almost obsessive belief in originality and individual creativity. It may be only those who try continually to reinvent the wheel that will lose out in the innovative race. In my opinion, the United States so long accustomed to leading the world may have lost the art of creative imitation and may have become deficient in scanning the world science and technology for potential commercial opportunities relative to what is done by our competitors, notably Japan.

There is also some evidence to suggest that the Japanese have been more tolerant of initial failures than U.S. firms persisting in certain innovations after U.S. firms have given up. Successful innovation especially in high technology fields depends upon a very subtle and elusive blend between cooperation and competition. Neither a model of pure competition nor one of aggregation of R&D. Efforts into the critical size units seems to provide an adequate explanation of innovative success. For many years Europeans believed that American technological success in comparison to Europe was explained by the size of U.S. firms and by our continental size market. In response to this belief, they followed a policy of encouraging consolidation and mergers and the formation of national champion firms or even multinational consortia with strong government backing. I think it fair to say that this policy was largely a failure although some recent successes from this strategy have been experienced.

The United States, in contrast, I think has been unduly obsessed with competition as the driving force for innovation. This is the theory that underlay the antitrust suits against IBM and AT&T, for example.

It remains to be seen whether the antitrust settlement with AT&T will injure or stimulate the innovativeness of the Bell Laboratories, one of the great success stories for the cooperative model of industrial research and the source of the most fundamental innovations for electronics and information technology in the 20th century. Many observers seem to feel that the Japanese may have found a superior middle ground between the purely cooperative and purely competitive models of innovation. The government has been successful in encouraging cooperation and division of labor in the early generic stages of innovation while still maintaining and enforcing competition in the later product and process development stages. Paradoxically, Japanese firms seem to be simultaneously more cooperative and more competitive than their American counterparts. In Japan, more innovation seems to be done in large firms and there is certainly more sharing of information between firms in the early, more fundamental stages of the innovative process.

Much has been made of the role of the Japanese Government in the innovation process in Japan but we must continually bear in mind by way of perspective that Japanese R&D is supported by government to a smaller degree than the R&D of any other country in the world. Thus the role of government in Japan has largely been indirect in stimulating and providing incentives for industrial investment in research rather than direct support of research.

Certainly one unique feature of the American scene compared with the Japanese is the importance of the small high-technology firm supported by venture capital. This is generally regarded as one of the greatest assets in the American scene but it also runs the greatest risk of waste and abuse of the resources for innovation. Probably the greatest strength in the American picture actually lies in the combination of small and large high-technology firms, combining some of the stimulation of competition with the benefits of aggregating technical resources and some measure of strategic planning. The availability of venture capital for small firms is certainly an important benefit of recent changes in the Tax Code and I hope this will be preserved.

I had some more remarks to make in my prepared testimony about the educational situation. Let me just make one remark. A great deal has been made of the production or the lack of production of scientists and engineers. I would just like to add to that the general point that many critics of the U.S. engineering scene have noted a very large wastage of engineering graduates in most of American industry.

Estimates of dropouts from engineering and technical work after 10 or 15 years of experience run as high as 50 percent. Salary levels of engineers who remain in technical work in industry tend to peak after 10 to 15 years of experience and too little effort is devoted by most firms to maintaining or refurbishing the technical skills of engineers. There is a tendency to mine the latest knowledge possessed by recent graduates without sufficient recognition of its rate of obsolescence.

Even in the general labor force the subdivision of jobs and skills discourages the learning of new skills and results in a work force less able to adjust to a rapidly changing environment of technology and foreign competition. It is difficult to obtain comparable data for Japan but the impression certainly persists that there is much more learning on the job. That this occurs may be suggested by the fact that wages and salaries in Japan tend to increase more with age and such increases persist to later ages in Japan than in the United States. The wage and salary structure may be both a cause and an effect of greater learning and diverse skill acquisition with seniority. Probably the single most important long-term industrial policy for the United States must relate to the development of human resources not only within the formal educational system but also perhaps even more importantly as part of the work experience itself. In a way the manufacturing floor and the office must become more like a laboratory or an advanced school in which production and learning are much more integrated than they are today.

Thank you.

[The prepared statement of Dr. Brooks follows:]

Testimony of Harvey Brooks, Benjamin Peirce Professor of Technology and Public Policy, Harvard University to the House Committee on Science and Technology, June 29, 1983.

My name is Harvey Brooks. I am Professor of Technology and Public Policy at Harvard University in the John F. Kennedy School of Government and the Division of Applied Sciences. I was trained in theoretical physics, served as Dean of Engineering and Applied Physics at Harvard from 1957 to 1975. Mt scientific work has been in underwater acoustics, nuclear engineering, and solid state physics and electronics. More recently I have been interested in all aspects of science policy, and in the state of U.S. competitiveness in technology, particular as it is impacted by science and technology policy.

As I understand it these hearings are concerned with the sources of recent Japanese competitive success in high technology, and with possible U.S. responses. I have to say at the outset that I have no great wisdom on this subject, despite the fact that I have spent a good deal of time thinking about during the last year or two. Therefore the ideas that I offer here are very tentative and speculative. They are an attempt more to bound the problem than to provide simple or conclusive answers.

Observers of the spectacular Japanese success in pentrating U.S. markets tend to divide themselves into two groups. On the one hand, are those who feel that Japanese successes owe largely to the fact that they do not "play fair" and they have taken unfair advantage of the relative openness of the U.S. economy and ideological devotion to free trade. In this view the Japanese market is closed, particularly to American innovative products, while the American market is open to invasion by Japanese innovations. The prime objective of these critics of U.S. policy is to change the ground rules so as to achieve a "level playing field", using Japanese dependence on access to the huge U.S. market as the tool with which to force Japanese policy conform to our view of what constitutes "fair competition."

On the other hand, there are those who feel that the loss of U.S. competitiveness to the Japanese is primarily of our own making, and results from a combination of short sighted U.S. management in our major industries and fiscal, tax, regulatory, and other public policies which hamper the ability of our domestic industires to compete in international markets. They point out that on an overall basis there is little asymmetry in the dgree of openness of the U.S. and Japanese economies, and that historically U.S. economic policy has been largely oriented towards domestic competition rather than international trade, and we have seldom considered the trade implications of either our management practices or our public policies towards business.

While I think there is some measure of truth in each of these schools of thought I am inclined myself to ally myself with those who believe that the major problem is our own policies and practices rather than the unfairness of our competitors. That is not to say that our competitors do not do things that violate our own ideas of fair trade; they certainly do, but I believe that even in the absence of these "unfair practices," our own industrial competitiveness would still be in trouble. In addition, of course, our own practices in trade often fail to conform to the ideals which we profess in international trade forums such as GATT. Our general principles are often violated in numerous exceptions designed to protect or preserve certain industries or to further other domestic priorities which we consider vital.

In what follows I would like to set forth a number of general observations on the sources of Japanese success, and to make a few points on our own policies and sources of potential strength and weaknesses in the arena of international competition. I would begin with the observation that the sources of Japanese competitive success are complex and multiple, and consequently there is no single or simple policy of U.S. response that is likely to make a big difference. Some catch-up on the part of our competitors was inevitable, given the extremely asyymetrical situation which existed in the aftermath of World War II. The overwhelming dominance of the U.S. in both trade and technology which existed in the 50's could not possibly have lasted, and indeed its correction was one of the major objectives of American post-war economic policy. The situation which prompts our concerns today is in fact a tribute to the success of our past policies. Unfortunately, many of the statistics which are quoted to support thr decline of U.S. international competitiveness use as a baseline the unrealistic and unsustainable relative position that existed in, say, 1960. This is not to say there is nothing to worry about. There are enough dramatic and short-term turn-arounds in our trade position in specific industries to warrant serious concern, and the very suddenness of some of these shifts is symptomatic ~~a~~ of new conditions of international competition, for which there is little past precedent. The new mobility of capital, knowledge, and technology in what is now a global economy entail a hitherto unknown degree of fluidity in comparative advantage, and this as much as the actual deterioration in our situation is the source of our concern.

In what follows I will set down a number of tentative propositions which I hope can provide a useful setting for our discussion.

1) It would be wrong to ascribe Japanese competitive success in high technology to R&D alone, nor to expect that the U.S. lag could be overcome by working exclusively, or even largely, on the R&D component of the total innovative process in isolation from other aspects. The U.S. still has the largest and most diversified R.&D. establishment in the world, and we still lead the world in the creation of industrial innovations, though not necessarily in their successful commercialization.

2) Some observers believe that the Japanese derive much greater commercial pay-off from their R&D dollars than does the U.S. Prof. Gene Gregory, an American management professor teaching in Japan, for example, has suggested that in terms of atents and innovations the Japanese get six times as much from their R&D dollar. Unfortunately, this is a rather"soft" figure, since patent statistics represent a notoriously weak measure of innovation. One possible source of Japanese research productivity is the avoidance of wastefull and inefficient competition in R&D. This is a complex question, however, since competition can be wasteful through duplication but also a great stimulus to innovation. This is a subject to which I will return, since it fundamental to the particular proposals I understand are being reviewed by this committee.
3) There is quite general agreement that a major element of Japanese success lies on the production and manufacturing side, not only in manufacturing technology, but pe haps even more in the organization of production and in the management of the manufacturing work force. Recent studies have indicated that the effective cost of capital for manufacturing in Japan may be nearly five times lower than in the U.S., or, to put the matter another way, the real rate of return of manufacturing capital may be much higher in Japan.

The Japanese economy is relatively weak and inefficient on the domestic distribution side, with a very weak system of consumer finance and credit. In other words capital has flowed to production rather than to consumption in Japan, and this on top of a much higher personal savings rate. Japanese success in the American consumer market could be desribed as a product of the successful marriage of efficient Japanese production to the highly skilled and efficient American distribution system, including, of course, consumer credit financing.
4) Another major element in Japanese success has been skill in exploiting learning curves and economies of scale. Their success in exports

has fed on itself, enabling Japan, starting from the existing state of the art, to traverse the learning curve much more rapidly than its competitors, thus achieving progressively greter cost advantages as the market expanded, and generating more surplus to feed back into product and process innovation which further reinforced the advantage.

5) Although Japanese success in recent years has been based on the adaptation of western, mainly American, technology, and on the capacity to commercialize it more rapidly than its competitors, it would be wrong to conclude from this that the Japanese are mere imitators who, once they have attained to the world state-of-the-art in a field, will not continue to move forward the frontiers of technology. On the contrary, history suggests that imitation,follwed by more and more innovative adaptation, leading eventually to pioneering, creative innovation forms the natural sequence of economic and industrial development. Successful imitation, far from being symptomatic of lack of originality as used to be thought, is the first step of learning to be creative. This is probably true of nations, as it seems to be of individuals, something which Americans may have forgotten with our almost obsessive belief in originality and individual creativity. It may be only those who try continually to reinvent the wheel that will lose out in the innovation race. In my opinion the U.S., so long accustomed to leading the world, may have lost the art of creative imitation, and is deficient in scanning the world's science and technology for potential commercial opportunities relative to what is done by its competitors, particularly Japan. I remember being struck by the statistic I read somewhere that Japanese municipal ~~official~~ officials recently spent $40 million in one yearjust trying to acquire new ideas from around the world on how better to manage cities---and that in a non-commercial field!

6) There is also some evidence to suggest that the Japanese have been
6) There is also some evidence to suggest that the Japanese have been

more tolerant of initial failures than U.S. firms. Almost all the well publicized Japanese successes---in automobiles, portablr and color TV, video recorders, VLSI, fine ceramics, computers---have been preceded by expensive failures, with success occurring at the second try. In the case of video recording, for example, American companies gave up after initial models failed in the market, while the Japanese companies persisted in further design refinements until their efforts met with success in the market. Undoubtedly the lower cost of capital in Japan had something to do with this, as did also the greater optimism which tends to pervade a growing economy as compared with a stagnant or slowly growing one.

7) Successful innovation, especially in high technology fields, depends upon a very subtle and elusive blend between cooperation and competition. Neither a model of pure competition nor one of aggregation of R&D efforts into "critical size" units seems to provide an adequate explanation of innovative success. For many years Europeans believed that American technological success in comparison to Europe was explained by the size of U.S. firms and by our continental market. In response they followed a policy of encouraging consoldiation and mergers and the formation of "national champion" firms or even multinational consortia with strong government backing. I think it is fair to say that this policy was largely a failure, although the recent successes of Airbus Industrie and the European Space Agency and its commercial offshoots may be an exception.

The U.S., in contrast, has been unduly obsessed with competition as the driving force for innovation. This is the theory that underlay the antitrust suits against IBM and ATT&T. It remains to be seen whether the settlement with AT&T will injure or stumulate the innovativeness of the Bell Laboratories---one of the great success stories for the cooperative model of industrial research, the source of many of the most fundamental innovations in electronics, communications, and information technology in the twentieth century.

Many observers seem to feel that the Japanese may have found a superior middle ground between the purely cooperative and purely competitive models of innovation. The government has been successful in encouraging cooperation and division of labor in the early, generic stages of innovation, while still maintaining and enforcing competition in the later product and process development stages. Paradoxically Japanese firms seem to be simultaneously more cooperative and more competitive than their American counterparts. In Japan more innovation seems to be done in large firms, and there is certainly more sharing of information between firms in the early, more fundamental stages of the innovative process.

Recent change of the political climate in the U.S. has been much more friendly to cooperation among firms at the R&D stage, especially for new, fundamental technologies. It is too early to say, however, what the effect of this will be on innovation. I doubt whether this measure alone is an adequate response to the Japanese challenge, but it seems almost certain that its effect will be positive.

8) Certainly one unique feature of the American scene compared with the Japanese is the importance in the U.S. of the small high technology firm, supported by venture capital. This is generally regarded as one of the greatest assets in the American scene, but it also runs the greatest riskof wasteful and duplicative use of the resources for innovation. Probably the greatest strength in the American picture lies in the combination of small and large high technology firms, combining some of the stimulation of competition with the benefits of aggregating technical resources and some measure of strategic planning. The availability of venture capital for small firms is certainly an important benefit of recent changes in the tax code.

8) There is considerable evidence that some part of the Japanese competitive advantage derives from the educational level of the work force, and from the management of the work force in such a

way as to continually enhance its capabilities. The science and mathematics performance of high school graduates in Japan is far superior to that of their counterparts in the United States. A higher percentage of university graduates study engineering, and Japan graduates absolutely more engineers than the United States, despite a smaller population. However, the stock of engineers is still greater in the United States than Japan. Even more important than educational level in Japan may be the fact that the organization of work in manufacturing better insures the continuous upgrading of skills, both in the labor force and among engineering professionals. Several critics of the U.S. engineering scene have noted the very large wastage of engineering graduates in most of industry. Estimates of drop-puts from engineering and technical work after ten to fifteen years of experience run as high as fifty percent. Salary levels of engineers who remain in technical work tend to peak after fifteen years experience, and too little effort is devoted by most firms to maintaining or refurbishing the technical skills of engineers. There is a tendency to mine the latest knowledge possessed by recent graduates, without sufficient recognition of its obsolescence. In the generallabor force the subdivision of jobs and skills discourages the learning of new skills and results in a work force less able to adjust to a rapidly changing environment of technology and foreign competition. It is difficult to obtain comparable data for Japan, but the impression is that there is more learning on the job. That this occurs may be suggested by the fact that wages and salaries in Japan tend to increase more with age,and such increases persist to later ages in Japan than in the U.S. The wage and salary structure may be both a cause and an effect of greater learning and diverse skill acquisition with seniority. Probably the single most important long term industrial policy for the U.S. must relate to the development of human resources, not only within the formal educational system, but also as part of the work experience itself. In a way the manufacturing floor or the office must become more like a laboratory or advanced school, in which production and learning are much more integrated than they are today.

Mr. **Gore**. Thank you for an excellent statement.

Our third witness on this panel is Mr. John Lacey, executive vice president for technology and planning with Control Data Corp.

Welcome, Mr. Lacey. If you care to summarize any portion of your statement feel free to do so.

STATEMENT OF JOHN LACEY, EXECUTIVE VICE PRESIDENT FOR TECHNOLOGY AND PLANNING, CONTROL DATA CORP.

Mr. **Lacey**. Thank you, Mr. Chairman.

I am grateful to you for the opportunity to participate in your hearing. High-technology industries in the United States are a proven vehicle for job creation and that fact alone is sufficient reason to place high national priority on assuring their international competitiveness and growth.

A wide range of potential options for enhancing our international competitiveness exists, but I believe that the most crucial single factor for success is cooperative research and development. Although I admit that it is not a panacea.

Our country's once strong international position in technology has been steadily eroding, while other nations have devised ways to accelerate their development and application of advanced technology. Our foreign competitors have greatly expanded R&D spending while they have minimized needless R&D duplication. They have dramatically increased their supply of trained scientific and technical personnel, and they have reduced the cost of capital to their key industries.

In the last few years, the U.S. position in microelectronics has gone from one of unquestioned and seemingly unassailable leadership to one of considerable vulnerability. The experience of being in second place in worldwide shipments of a particular advanced microelectronic component—the 64K-bit random access memory chip—has occurred for the first time. A report by a Government research laboratory raises the possibility that it may be dependent on Japan for supercomputers by the end of this decade. Almost 2 years ago Japan sponsored an international conference to announce its intention to become the world leader in computer by 1990.

As these developments show, the greatest progress in advancing and exploiting technology has been made by Japan in targeted industries. Japanese strategy continues to be one of concentration on a few industries at a time, control them, and then move on to the next target. Microelectronics and computers are high on their current list.

The targeting process has been straightforward and very well executed. Japan imports a base technology from the West, enhances it through the vehicle of Government-sponsored cooperative R&D—then protect the industry from foreign competition in its home market, which, of course, is the fastest growing and second largest market in the world. After gaining experience, economies of scale and consequent cost parity at home, they move out into the world market to further increase production volumes and reduce unit costs. They then use that cost advantage to improve the quality of their product, and eventually they are able to sell a better product at lower prices and at profit margins which are acceptable to them in the context of the Japanese economic system. The result for them is market dominance. The result for the U.S. firms, at best, is reduced profits, fewer jobs, and reduced ability to invest in new competitive technologies.

It is clear that this highly sophisticated, well-coordinated and superbly executed strategy has its foundation in Government-promoted cooperation at the base technology level. Its significances is not necessarily in terms of dollars but it is an ominous threat, that has serious implications for virtually all modern industries, and by implication for our national security.

An adequate response will require many and varied actions. However, by far, the greatest and most rapid progress can be achieved within U.S. industry, by increasing our efficiency in developing and applying technology.

The easy and relatively inexpensive technology advances in microelectronics and computers are behind us. Each successive advance has required a greater commitment of capital and intellectual resources than did the previous one. As a result, smaller enterprises, left to go it alone, have been forced more and more to pursue too few technology alternatives—and that brings with it high risk of falling behind and becoming unable to compete in the longer term.

Paradoxically, while we suffer, industrywide, from the scarcity of capital and skilled personnel, we also suffer from wasteful duplication of technology efforts among the companies in the industry. The use of basic knowledge by one party should never preclude its use by another. For every corporation to rediscover what others have already learned is wasteful—not only for each company—but also for society.

These two factors of resource scarcity and heightened international competition are eroding the innovative capacity of U.S. advanced electronics industries. If we are to preserve an economically healthy number of competitors, we simply must combine technology resources in time to meet and match the highly organized overseas competition.

Control Data's pioneering efforts in advocating and practicing broad based technological cooperation during the past 10 to 15 years have demonstrated that such an approach not only works—but that it is essential to the maintenance of a vigorous competitive environment. We are today participating in five consortium organizations, including Magnetic Peripherals, Inc., in which five companies participate to produce a line of magnetic memories for input to and output from computers.

Recently the need for technology cooperation has become more widely recognized. The Microelectronics and Computer Technology Corp. (MCC), is the salient example.

Control Data is a member of MCC and along with a dozen or so other companies was very active in its formation. We were driven to do so by the factors that I have previously described. But its specific structure was influenced by additional considerations and I would like to mention a few of them.

We felt the need to concentrate on those areas of technology in which individual firms cannot effectively operate due to unacceptably high cost, high risk, or shortages of critical skills.

We wanted to provide member firms with the incentive to invest up front in MCC technology programs, but at the same time, we wanted the technology to foster competition by making it available to other companies on reasonable terms. This is especially important to small companies, which are typically very efficient in converting base technology into innovative products and services.

We wanted to create an entity that can be effective even if funded solely by the private sector. This approach is in line with present national policy to reduce the rate of increase of Federal spending. But, more importantly, it is permitting faster implementation to occur.

Above all, we wanted to leave plenty of room for each shareholder or licensee of MCC to add value to the MCC technology and compete in markets of its own choosing with products and services of its own design and conception. The ultimate beneficiary of this policy is the whole country through increased job opportunities and the expansion in the choice and competitiveness of products and services available to individual consumers.

In view of the national and individual benefits just presented, why isn't technological cooperation more prevalent among our high technology industries?

There are at least two very important reasons:

The first is our business culture. It evolved in an environment of a huge and expanding domestic market, in which competition for most U.S. corporations was mainly with other U.S. companies. It emphasizes short-term investment horizons and it fosters a misplaced view of what is involved in maintaining a proprietary position. But our attitudes have become anachronistic as the world we live in—and compete in—has changed fundamentally in the last 10 years and will change even more rapidly in the next 20 in terms of technological change, in terms of capital intensity and in terms of international competition.

The second and more important reason for the lack of cooperation in U.S. research and development, however, is the widespread fear of inadvertently violating our century-old antiturst laws, even though they ignore current economic realities and promote inefficiency in the name of antitrust enforcement. Many companies are deeply concerned that the Justice Department or the courts will interpret "cooperation" to mean "conspiracy"—even in R&D—and that they will therefore be exposed to large treble damages awards.

Even though research consortia are typically completely lawful, the uncertainties in the interpretation and application of U.S. antitrust laws are a major obstacle to pooling resources in research and development, very little official guidance exists as to what constitutes a lawfully structured joint R&D venture or what conduct will ultimately be considered lawful by the courts.

Thus, participants in a cooperative R&D venture are forever under the threat of lawsuits which are counterproductive both in terms of legal costs and effort diverted from research.

It is time to correct this problem. In order to achieve widespread technology cooperation, we need a change in the tenor of current laws—from laws that sometimes permit it—to legislation that encourages it. Within the last year, a number of public and elected officials have begun to emphasize the need to remove unnecessary obstacles to cooperation in R&D. But there is an urgent need for Congress to act to clear away the uncertainties in the interpretation and the application of the law. Several bills have been introduced in this session of the Congress which recognize the shortcomings I have described.

Among these, H.R. 1952, introduced by Congressmen Synar, Gephardt, Wyden, and Zschau and cosponsored by several members of this committee, embodies the most comprehensive and effective solution. I won't dwell on that. Others tomorrow will discuss this more fully I am sure. I will say no more except to ask that you and your colleagues in the House support H.R. 1952.

Thank you very much.

[The biographical sketch and prepared statement of Mr. Lacey follow:]

JOHN W. LACEY
EXECUTIVE VICE PRESIDENT
TECHNOLOGY & PLANNING
CONTROL DATA CORPORATION
BIOGRAPHY

John W. Lacey, Executive Vice President, Technology & Planning, Control Data Corporation, was born and educated in England. He received his undergraduate and graduate degrees from Oxford University.

Mr. Lacey has corporate-wide functional authority and responsibility for the company's strategic planning, product and services strategies, research and development, manufacturing and quality activities.

During his twenty-three years with the company Mr. Lacey has assumed positions of steadily increasing executive responsibility. Most recently, as President of the Systems Company, he directed a $700,000,000 business, which included commercial general purpose computer systems, military data systems, in space, airborne, surface and underwater applications, computer-based education and health care services utilizing computer technology.

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JOHN W. LACEY
CONTROL DATA CORPORATION
TESTIMONY TO
SUBCOMMITTEE ON SCIENCE RESEARCH & TECHNOLOGY
AND INVESTIGATIONS OVERSIGHT
WASHINGTON, D.C.
JUNE 29, 1983

MY NAME IS JOHN W. LACEY, EXECUTIVE VICE PRESIDENT OF CONTROL DATA CORPORATION, WITH HEADQUARTERS IN MINNEAPOLIS, MINNESOTA. BUSINESS, INDUSTRIES, EDUCATION INSTITUTIONS AND GOVERNMENTS THROUGHOUT THE WORLD USE CONTROL DATA COMPUTER SERVICES AND SYSTEMS, PERIPHERAL PRODUCTS AND FINANCIAL SERVICES.

I AM GRATEFUL FOR THE OPPORTUNITY TO BE HERE TODAY AND TO PARTICIPATE IN THESE HEARINGS. HIGH TECHNOLOGY INDUSTRIES IN THE UNITED STATES ARE A PROVEN VEHICLE FOR JOB CREATION AND THAT FACT ALONE IS SUFFICIENT REASON TO PLACE HIGH NATIONAL PRIORITY ON ASSURING THEIR INTERNATIONAL COMPETITIVENESS AND GROWTH.

A WIDE RANGE OF POTENTIAL OPTIONS FOR ENHANCING OUR INTERNATIONAL COMPETITIVENESS EXISTS, BUT I BELIEVE THAT THE MOST CRUCIAL SINGLE FACTOR FOR SUCCESS IS COOPERATIVE RESEARCH AND DEVELOPMENT. COOPERATION HAS UNIQUE POTENTIAL FOR PROTECTING AND ENHANCING THE COMPETITIVE POSITION OF NOT ONLY U.S. HIGH TECHNOLOGY INDUSTRIES, BUT ALSO OTHER INDUSTRIES OF EQUAL IMPORTANCE TO OUR ECONOMY.

OUR COUNTRY'S ONCE STRONG INTERNATIONAL POSITION IN TECHNOLOGY HAS BEEN STEADILY ERODING, WHILE OTHER NATIONS HAVE DEVISED WAYS TO ACCELERATE THEIR DEVELOPMENT AND APPLICATION OF ADVANCED TECHNOLOGY. OUR FOREIGN COMPETITORS HAVE GREATLY EXPANDED R&D SPENDING WHILE THEY HAVE MINIMIZED NEEDLESS R&D DUPLICATION. THEY HAVE DRAMATICALLY INCREASED THEIR SUPPLY OF TRAINED SCIENTIFIC AND TECHNICAL PERSONNEL, AND THEY HAVE REDUCED THE COST OF CAPITAL TO THEIR KEY INDUSTRIES.

IN THE LAST FEW YEARS, THE U.S. POSITION IN MICROELECTRONICS HAS GONE FROM ONE OF UNQUESTIONED AND SEEMINGLY UNASSAILABLE LEADERSHIP TO ONE OF CONSIDERABLE VULNERABILITY. THE EXPERIENCE OF BEING IN SECOND PLACE IN WORLDWIDE SHIPMENTS OF A PARTICULAR ADVANCED MICROELECTRONIC COMPONENT --- THE 64 THOUSAND-BIT RANDOM ACCESS MEMORY CHIP --- HAS OCCURRED FOR THE FIRST TIME. A REPORT BY A GOVERNMENT RESEARCH LABORATORY RAISES THE POSSIBILITY THAT IT MAY BE DEPENDENT ON JAPAN FOR SUPERCOMPUTERS BY THE END OF THIS DECADE. ALMOST TWO YEARS AGO JAPAN SPONSORED AN INTERNATIONAL CONFERENCE TO ANNOUNCE ITS INTENTION TO BECOME THE WORLD LEADER IN COMPUTING BY 1990. MEANWHILE, JAPAN ALREADY DOMINATES IN LOW COST PRINTERS AND THREE INCH MAGNETIC DISK DRIVES, BOTH OF WHICH ARE TIED TO THE EXPLODING PERSONAL COMPUTER MARKET.

AS THESE DEVELOPMENTS SHOW, THE GREATEST PROGRESS IN ADVANCING AND EXPLOITING TECHNOLOGY HAS BEEN MADE BY JAPAN IN TARGETED INDUSTRIES. JAPANESE STRATEGY CONTINUES TO BE ONE OF CONCENTRATION ON A FEW INDUSTRIES AT A TIME, CONTROL THEM, AND THEN MOVE ON TO THE NEXT TARGET. MICROELECTRONICS AND COMPUTERS ARE HIGH ON THEIR CURRENT LIST.

THE TARGETING PROCESS HAS BEEN STRAIGHTFORWARD AND VERY WELL EXECUTED. JAPAN IMPORTS A BASE TECHNOLOGY FROM THE WEST, ENHANCES IT THROUGH THE VEHICLE OF GOVERNMENT SPONSORED COOPERATIVE R&D ---- THEN PROTECTS THE INDUSTRY FROM FOREIGN COMPETITION IN ITS HOME MARKET, WHICH, OF COURSE, IS THE FASTEST GROWING AND SECOND LARGEST MARKET IN THE WORLD. AFTER GAINING EXPERIENCE, ECONOMIES OF SCALE AND CONSEQUENT COST PARITY AT HOME, THEY MOVE OUT INTO THE WORLD MARKET TO FURTHER INCREASE PRODUCTION VOLUMES AND REDUCE UNIT COSTS. THEY THEN USE THAT COST ADVANTAGE TO IMPROVE THE QUALITY OF THEIR PRODUCT, AND EVENTUALLY THEY ARE ABLE TO SELL A BETTER PRODUCT AT LOWER PRICES AND AT PROFIT MARGINS WHICH ARE ACCEPTABLE TO THEM IN THE CONTEXT OF THE JAPANESE ECONOMIC SYSTEM. THE RESULT FOR THEM IS MARKET DOMINANCE. THE RESULT FOR THE U.S. FIRMS, AT BEST, IS REDUCED PROFITS, FEWER JOBS AND REDUCED ABILITY TO INVEST IN NEW COMPETITIVE TECHNOLOGIES.

IT IS CLEAR THAT THIS HIGHLY SOPHISTICATED, WELL COORDINATED AND SUPERBLY EXECUTED STRATEGY HAS ITS FOUNDATION IN GOVERNMENT-PROMOTED COOPERATION AT THE BASE TECHNOLOGY LEVEL. IT IS AN OMINOUS THREAT, THAT HAS SERIOUS IMPLICATIONS FOR VIRTUALLY ALL MODERN INDUSTRIES, AND BY IMPLICATION FOR OUR NATIONAL SECURITY. THE PERVASIVENESS OF MICROELECTRONICS AND COMPUTER TECHNOLOGY IN MANY OTHER INDUSTRIES ACCENTUATES THE THREAT OF JOB LOSSES IF OUR POSITION ERODES MATERIALLY. LAST YEAR, FOR EXAMPLE, THE CABINET COUNSEL ON COMMERCE AND TRADE REPORTED THAT FOR EVERY JOB CREATED WITHIN A HIGH TECHNOLOGY INDUSTRY, EIGHT JOBS ARE CREATED IN INDUSTRIES THAT SUPPLY IT.

AN ADEQUATE RESPONSE WILL REQUIRE MANY AND VARIED ACTIONS. HOWEVER, BY FAR, THE GREATEST AND MOST RAPID PROGRESS CAN BE ACHIEVED WITHIN U.S. INDUSTRY, BY INCREASING OUR EFFICIENCY IN DEVELOPING AND APPLYING TECHNOLOGY.

THE EASY AND RELATIVELY INEXPENSIVE TECHNOLOGY ADVANCES IN MICROELECTRONICS AND COMPUTERS ARE BEHIND US. EACH SUCCESSIVE ADVANCE HAS REQUIRED A GREATER COMMITMENT OF CAPITAL AND INTELLECTUAL RESOURCES THAN DID THE PREVIOUS ONE. AS A RESULT, SMALLER ENTERPRISES, LEFT TO GO IT ALONE, HAVE BEEN FORCED MORE AND MORE TO PURSUE TOO FEW TECHNOLOGY ALTERNATIVES --- AND THAT BRINGS WITH IT HIGH RISK OF FALLING BEHIND AND BECOMING UNABLE TO COMPETE IN THE LONGER TERM. AT BEST, THE RESULT IS CONSERVATIVE R&D PROGRAMS RATHER THAN THE HIGH RISK, HIGHLY INNOVATIVE RESEARCH THAT IS ESSENTIAL TO LONG-TERM COMPETITIVENESS.

PARADOXICALLY, WHILE WE SUFFER, INDUSTRY WIDE, FROM THE SCARCITY OF CAPITAL AND SKILLED PERSONNEL, WE ALSO SUFFER FROM WASTEFUL DUPLICATION OF TECHNOLOGY EFFORTS AMONG THE COMPANIES IN THE INDUSTRY. THE USE OF BASIC KNOWLEDGE BY ONE PARTY SHOULD NEVER PRECLUDE ITS USE BY ANOTHER. FOR EVERY CORPORATION TO REDISCOVER WHAT OTHERS HAVE ALREADY LEARNED IS WASTEFUL -- NOT ONLY FOR EACH COMPANY --- BUT ALSO FOR SOCIETY.

THESE TWO FACTORS OF RESOURCE SCARCITY AND HEIGHTENED INTERNATIONAL COMPETITION ARE ERODING THE INNOVATIVE CAPACITY OF U.S. ADVANCED ELECTRONICS INDUSTRIES. IF WE ARE TO PRESERVE AN ECONOMICALLY HEALTHY NUMBER OF COMPETITORS, WE SIMPLY MUST COMBINE TECHNOLOGY RESOURCES IN TIME TO MEET AND MATCH THE HIGHLY ORGANIZED OVERSEAS COMPETITION.

CONTROL DATA'S PIONEERING EFFORTS IN ADVOCATING AND PRACTICING BROAD BASED TECHNOLOGICAL COOPERATION DURING THE PAST TEN-FIFTEEN YEARS HAVE DEMONSTRATED THAT SUCH AN APPROACH NOT ONLY WORKS -- BUT THAT IT IS ESSENTIAL TO THE MAINTENANCE OF A VIGOROUS COMPETITIVE ENVIRONMENT. WE ARE TODAY PARTICIPATING IN FIVE CONSORTIUM ORGANIZATIONS, INCLUDING MAGNETIC PERIPHERALS, INC., IN WHICH FIVE COMPANIES PARTICIPATE TO PRODUCE A LINE OF MAGNETIC MEMORIES FOR INPUT TO AND OUTPUT FROM COMPUTERS.

RECENTLY THE NEED FOR TECHNOLOGY COOPERATION HAS BECOME MORE WIDELY RECOGNIZED. THE MICROELECTRONICS AND COMPUTER TECHNOLOGY CORPORATION (MCC), IS THE SALIENT EXAMPLE.

CONTROL DATA IS A MEMBER OF MCC AND ALONG WITH A DOZEN OR SO OTHER COMPANIES WAS VERY ACTIVE IN ITS FORMATION. WE WERE DRIVEN TO DO SO BY THE FACTORS THAT I HAVE PREVIOUSLY DESCRIBED. BUT ITS SPECIFIC STRUCTURE WAS INFLUENCED BY ADDITIONAL CONSIDERATIONS.

WE FELT THE NEED TO CONCENTRATE ON THOSE AREAS OF TECHNOLOGY IN WHICH INDIVIDUAL FIRMS CANNOT EFFECTIVELY OPERATE DUE TO UNACCEPTABLY HIGH COST, HIGH RISK, OR SHORTAGES OF CRITICAL SKILLS.

WE WANTED TO PROVIDE MEMBER FIRMS WITH THE INCENTIVE TO INVEST UP FRONT IN MCC TECHNOLOGY PROGRAMS, BUT AT THE SAME TIME, WE WANTED THE TECHNOLOGY TO FOSTER COMPETITION BY MAKING IT AVAILABLE TO OTHER COMPANIES ON REASONABLE TERMS. THIS IS ESPECIALLY IMPORTANT TO SMALL COMPANIES, WHICH ARE TYPICALLY VERY EFFICIENT IN CONVERTING BASE TECHNOLOGY INTO INNOVATIVE PRODUCTS AND SERVICES.

WE WANTED TO CREATE AN ENTITY THAT CAN BE EFFECTIVE EVEN IF FUNDED SOLELY BY THE PRIVATE SECTOR. THIS APPROACH IS IN LINE WITH PRESENT NATIONAL POLICY TO REDUCE THE RATE OF INCREASE OF FEDERAL SPENDING. BUT, MORE IMPORTANTLY, IT IS PERMITTING FASTER IMPLEMENTATION TO OCCUR.

ABOVE ALL, WE WANTED TO LEAVE PLENTY OF ROOM FOR EACH SHAREHOLDER OR LICENSEE OF MCC TO ADD VALUE TO THE MCC TECHNOLOGY AND COMPETE IN MARKETS OF ITS OWN CHOOSING WITH PRODUCTS AND SERVICES OF ITS OWN DESIGN. THE ULTIMATE BENEFICIARY OF THIS POLICY IS THE WHOLE COUNTRY THROUGH INCREASED JOB OPPORTUNITIES AND THE EXPANSION IN THE CHOICE AND COMPETITIVENESS OF PRODUCTS AND SERVICES AVAILABLE TO INDIVIDUAL CONSUMERS.

IN VIEW OF THE NATIONAL AND INDIVIDUAL BENEFITS JUST PRESENTED, WHY ISN'T TECHNOLOGICAL COOPERATION MORE PREVALENT AMONG OUR HIGH TECHNOLOGY INDUSTRIES?

THERE ARE AT LEAST TWO VERY IMPORTANT REASONS:

THE FIRST IS OUR BUSINESS CULTURE, IT EVOLVED IN AN ENVIRONMENT OF A HUGE AND EXPANDING DOMESTIC MARKET, IN WHICH COMPETITION FOR MOST U.S. CORPORATIONS WAS MAINLY WITH OTHER U.S. COMPANIES. IT EMPHASIZES SHORT-TERM INVESTMENT HORIZONS AND IT FOSTERS A MISPLACED VIEW OF WHAT IS INVOLVED IN MAINTAINING A PROPRIETARY POSITION. BUT OUR ATTITUDES HAVE BECOME ANACHRONISTIC AS THE WORLD WE LIVE IN -- AND COMPETE IN -- HAS CHANGED FUNDAMENTALLY IN THE LAST TEN YEARS AND WILL CHANGE EVEN MORE RAPIDLY IN THE NEXT TWENTY IN TERMS OF TECHNOLOGICAL CHANGE, IN TERMS OF CAPITAL INTENSITY AND IN TERMS OF INTERNATIONAL COMPETITION.

THE SECOND AND MORE IMPORTANT REASON FOR THE LACK OF COOPERATION IN U.S. RESEARCH AND DEVELOPMENT, HOWEVER, IS THE WIDESPREAD FEAR OF INADVERTENTLY VIOLATING OUR CENTURY-OLD ANTITRUST LAWS, EVEN THOUGH THEY IGNORE CURRENT ECONOMIC REALITIES AND PROMOTE INEFFICIENCY IN THE NAME OF ANTITRUST ENFORCEMENT. MANY COMPANIES ARE DEEPLY CONCERNED THAT THE JUSTICE DEPARTMENT OR THE COURTS WILL INTERPRET "COOPERATION" TO MEAN "CONSPIRACY" -- EVEN IN R & D -- AND THAT THEY WILL THEREFORE BE EXPOSED TO LARGE TREBLE DAMAGES AWARDS.

EVEN THOUGH RESEARCH CONSORTIA ARE TYPICALLY COMPLETELY LAWFUL, THE UNCERTAINTIES IN THE INTERPRETATION AND APPLICATION OF U.S. ANTITRUST LAWS ARE A MAJOR OBSTACLE TO POOLING RESOURCES IN RESEARCH AND DEVELOPMENT. VERY LITTLE OFFICIAL GUIDANCE EXISTS AS TO WHAT CONSTITUTES A LAWFULLY-STRUCTURED JOINT R & D VENTURE OR WHAT CONDUCT WILL ULTIMATELY BE CONSIDERED LAWFUL BY THE COURTS.

THUS, PARTICIPANTS IN A COOPERATIVE R&D VENTURE ARE FOREVER UNDER THE THREAT OF LAWSUITS WHICH ARE COUNTERPRODUCTIVE BOTH IN TERMS OF LEGAL COSTS AND EFFORT DIVERTED FROM RESEARCH.

IT IS TIME TO CORRECT THIS PROBLEM. IN ORDER TO ACHIEVE WIDESPREAD TECHNOLOGY COOPERATION, WE NEED A CHANGE IN THE TENOR OF CURRENT LAWS -- FROM LAWS THAT SOMETIMES PERMIT IT -- TO LEGISLATION THAT ENCOURAGES IT. WITHIN THE LAST YEAR, A NUMBER OF PUBLIC AND ELECTED OFFICIALS HAVE BEGUN TO EMPHASIZE THE NEED TO REMOVE UNNECESSARY OBSTACLES TO COOPERATION IN R&D. BUT THERE IS AN URGENT NEED FOR CONGRESS TO ACT TO CLEAR AWAY THE UNCERTAINTIES IN THE INTERPRETATION AND THE APPLICATION OF THE LAW. SEVERAL BILLS HAVE BEEN INTRODUCED IN THIS SESSION OF THE CONGRESS WHICH RECOGNIZE THE SHORTCOMINGS I HAVE DESCRIBED.

AMONG THESE, HR.1952, INTRODUCED BY CONGRESSMEN SYNAR, GEPHARDT, WYDEN, AND ZSCHAU AND COSPONSORED BY SEVERAL MEMBERS OF THIS COMMITTEE, EMBODIES THE MOST COMPREHENSIVE AND EFFECTIVE SOLUTION. IT IS IMPORTANT TO NOTE THAT HR.1952 WOULD NOT CHANGE BUT RATHER CLARIFY U.S. ANTITRUST LAWS. UNDER ITS PROVISIONS, A SET OF OBJECTIVE STANDARDS OR RULES WOULD BE ENACTED ACCORDING TO WHICH THOSE COMPANIES DESIRING TO COOPERATE IN R&D COULD LEGALLY PLAN AND IMPLEMENT THEIR ACTIVITIES. STATUTORY RULES WOULD DEAL WITH SUCH CRITERIA AS THE SCOPE AND DURATION OF PERMISSIBLE ACTIVITIES; THE PERMISSIBLE DEGREE OF MARKET SHARE; PERMISSIBLE AND IMPERMISSIBLE COLLATERAL RESTRAINTS ON PARTICIPANTS; AND THE QUESTION OF ACCESS TO THE VENTURE AND TO THE RESULTS OF ITS RESEARCH ACTIVITIES. OF COURSE, ACTIVITIES FALLING OUTSIDE OF THE STANDARDS WOULD REMAIN FULLY SUBJECT TO THE DUAL DETERRENTS OF GOVERNMENTAL AND PRIVATE DAMAGE ACTIONS.

MY COLLEAGUE, MR. STEVE OLSON, ASSOCIATE COUNSEL FOR CONTROL DATA, AND OTHERS I'M SURE, WILL DISCUSS THIS PENDING LEGISLATION MORE FULLY TOMORROW, SO I WILL SAY NO MORE EXCEPT TO URGE YOU AND YOUR COLLEAGUES IN THE HOUSE TO SUPPORT HR.1952.

TODAY, THE U.S. IS THE ACKNOWLEDGED WORLD LEADER IN COMPUTERS AND MICROELECTRONICS, JUST AS WE ONCE WERE IN TEXTILES, CARS, STEEL AND CONSUMER ELECTRONICS. BUT THERE ARE GRAVE THREATS TO THAT LEADERSHIP. I AM CONVINCED, HOWEVER, THAT THE STAGE IS SET FOR INDUSTRY INITIATIVES THAT WILL REVERSE THE DETERIORATION OF OUR WORLD LEADERSHIP IN TECHNOLOGY. GIVEN A CHANCE, WE WILL PRESERVE AND ENHANCE FREE-MARKET COMPETITION AND AT THE SAME TIME EXPAND EMPLOYMENT OPPORTUNITIES, BROADEN THE CHOICES AVAILABLE TO CONSUMERS, AND STRENGTHEN OUR NATIONAL SECURITY.

WE TRULY HOPE THIS CONGRESS CAN BEGIN TO ADOPT THE POLICIES THAT WILL INSURE CONTINUED U.S. TECHNOLOGICAL PRE-EMINENCE.

THANK YOU. I WOULD BE HAPPY TO RESPOND TO YOUR QUESTIONS.

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Mr. Gore. Again we thank you and we will hold our questions.

The final witness is Mr. Erich Bloch, vice president of IBM and chairman of the Semiconductor Research Corp.

Mr. Bloch, we are happy to have you here and we invite you to begin your statement.

STATEMENT OF ERICH BLOCH, VICE PRESIDENT, IBM, AND CHAIRMAN, SEMICONDUCTOR RESEARCH CORP.

Mr. Bloch. Thank you, Mr. Chairman. I am here today as chairman of the board of the Semiconductor Research Cooperative, a subsidiary of the SIA devoted to cooperative research through the pooling of industry resources.

I am grateful for the opportunity to appear before this committee to describe the reasons for the SRC endeavor, because I believe strongly that it is a successful prototype for other U.S. industry sectors.

I intend to cover the rationale leading up to the SRC, its operation and the benefits to the semiconductor industry, as well as the benefits accruing to academia and the country as a whole.

The semiconductor industry has been in existence for only 30 years, but in this short time it has grown to a $15 billion worldwide industry. More important it is a basic industry, just as basic as steel, oil, or chemicals were in the past. Its products are pervasive and are the foundation of other high technology sectors such as computers, telecommunications and instrumentation. They are also used ever more extensively in consumer products, play an increasing role in the manufacturing sector of our economy and are enhancing productivity in all of industry.

Up to 5 years ago, the semiconductor industry was primarily a U.S. industry, not only in innovation and new applications, but also in both demand and supply of products. By 1982, however, the U.S. semiconductor industry share of the worldwide market had eroded to 55 percent, while that of Japan increased to 35 percent. In 1983 further erosion of market share by U.S. companies is predicted.

But there is a more ominous sign: The most important product segment is that of MOS—Metal Oxide Semiconductor—memory and logic. A specific high volume logic chip such as a microprocessor—computer on a chip—is at the heart of most recent innovative applications such as personal computers, robotics, and video games. Both memory and logic are interdependent from the standpoint of the manufacturing process.

While the manufacturing process for a memory chip forms the base process for logic chips, memory chip volume is a prerequisite for cost efficiency in microprocessors. Preeminence in memory, therefore, is a prerequisite to, and harbinger of, preeminence in logic and microprocessors. Yet, in 1982 the worldwide MOS sales of Japanese companies increased by 14.5 percent; while those of U.S. based companies increased by only 8.6 percent. Even in the U.S. market, Japan out stripped U.S. companies in a sales increase of 67 percent versus 17 percent for our domestic producers. Most of this increase came from Japanese sales of 64K memory devices as mentioned by the chairman.

Why this turn of events?

First of all, foreign countries—in particular, Japan—have recognized the strategic importance of the semiconductor industry.

Second, the rapid worldwide diffusion of U.S. technology and innovation has provided a base to build on.

Third, Japan has especially targeted the MOS memory products as an efficient way to achieve market share in semiconductor products and appears to be using it as an entry wedge to become a world force in all aspects of semiconductors.

Fourth, Japanese industry under MITI guidance received financial support from government agencies through favorable loans and research subsidies. It pooled some engineers and scientific talent and has fostered the growth in semiconductor research and development.

This has resulted in investment on a greater scale than the U.S. semiconductor industry could afford to do, despite the fact that the investment in capital and R&D by the U.S. semiconductor industry in 1982 was 14 percent and 9.8 percent, respectively, compared to 7 percent and 3 percent by U.S. industry as a whole.

Japan, however, is outspending the U.S. semiconductor companies in both of these areas: 20 percent in capital investment and 15 percent in R&D spending.

Fifth, Japan has consistently provided quality products which are comparable to the best available in the United States. This was a key strategy and essential to their market share growth. Despite important efforts and progress by the U.S. merchant semiconductor industry, there is still the perception that Japan has equal or better quality.

At the same time, the research is becoming more capital intensive and there are shortages of trained manpower that make staffing difficult. For these reasons some research efforts are now beyond the affordability of individual companies.

In addition, the approach that each company performs its independent research causes overlap and much unnecessary duplication.

Realizing that research is the foundation of its well being, the U.S. semiconductor industry 2 years ago established the Semiconductor Research Cooperative to increase much needed research effort.

By pooling funds and contracting for priority projects to the research universities, industry is accomplishing important objectives:

Increasing semiconductor research in the United States;

Sharing results among member companies and avoiding duplication of effort;

Providing research opportunities and upgrading laboratories in the universities;

Attracting more students to this vital field of study and improving the quality of education.

Today, this cooperative is functioning. In 1982 about $5 million was committed to this effort by participating companies. In 1983 the commitment exceeds $11 million and will be increasing again in 1984.

This commitment adds significantly to the basic research effort in semiconductors. While the total semiconductor R&D spending of U.S. industry is large—in excess of $500 million—most of it is for development and applied research. It is estimated that less than 5 percent is applied to basic research. That is why I am saying that $11 million is a significant increase.

It is clear from these goals that the focus is on research, rather than development. While the research results accrue to all participants, each in turn must apply the results separately and independently to develop its own products for the world marketplace.

The companies that participate in this effort are merchant semiconductor companies, companies that sell semiconductor components in the marketplace, and companies that manufacture semiconductors for their own use. The latter group are computer companies, instrument makers, manufacturers of communications equipment. Equipment and materials manufacturers that supply the semiconductor industry are also participants. Development still needs to be done by each company to improve the fruits of this research; 100 academic researchers and 125 graduate students are now supported by these contracts.

The SRC is considering extending its mission into areas other than pure research. In particular, the industry requires focus on manufacturing automation, productivity improvements and manufacturing quality. Combining the research work of universities with demonstration manufacturing facilities would allow the industry to solve basic problems and develop products that, under normal circumstances, would not be available for use until much later in time.

Specifically, the SRC is considering a pilot program of process definition and advanced design for a 4-megabit memory chip. This could leapfrog the normal development cycle; bring together in one place the critical mass for such an effort; and demonstrate the manufacturability and reliability of such a device.

A combination of resources could be brought to this task:

Venture capital for the R&D portion of the project;

Skill and expertise from the industry and universities;

A demanding leading edge requirement, manufacturing funding, and an early usage for defense requirements;

Licensing of the design and process to the U.S. semiconductor industry for commercial exploitation.

And repayment to the R&D process and investment through R&D licenses. Let me suggest for one moment what I think Congress can do to support this kind of an effort in particular.

First, assuring the continuation of the R&D tax credit beyond its 1986 expiration date;

Second, liberalizing the credit for industry funded university research. Today, the provision is for a 25-percent tax credit on increases over the previous 3-year average base. The 25-percent tax credit should be applied to all industry funds in support of university research.

Mr. GORE. Mr. Bloch, I am afraid I am going to have to interrupt you briefly there. We have a second bell for a vote. Chairman Walgren went over early so we nave a kind of a relay here and he should be back to crank up the hearing again and get the completion of your statement in about 2 or 3 minutes so it should not be much of a delay but I have to go over and vote so we will take a short recess.

[Brief recess.]

Mr. WALGREN [presiding]. Let me call us back to order and I understand when we broke off that Mr. Bloch was in the middle of indicating some direct suggestions for the congressional role and I would certainly appreciate it if you would complete that summary.

Mr. BLOCH. Thank you, Mr. Chairman.

I was almost done but let me just review what I said.

The continuation of the R&D tax credit beyond 1986 expiration date was item No. 1. Item No. 2, liberalizing the tax credit so that industry spending research dollars in universities are getting credit for the whole of the research dollars and not just for the incremental increase over the previous 3 years.

The third item which I did not get to and I will get to now is clarifying and liberalizing the antitrust laws to permit joint research efforts, where the sharing of results does not inhibit product competition in the marketplace. Lumping R&D together in our laws is a gross oversimplification I think and just separating these two things would make it much clearer.

The last item I want to say is allowing foreign students to enter the U.S. work force would help the manpower shortage and I know that is being prepared in a bill for consideration in the House and the Senate.

This gets me to the end of my remarks.

I hope I shed some light on the reasons for the activities of the SRC. I believe it not only benefits the semiconductor industry but all U.S. industry and the whole U.S. economy. I thank you for giving me the opportunity to testify.

[The biographical sketch and prepared statement of Mr. Bloch follow:]

ERICH BLOCH

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Erich Bloch received his education in electrical engineering at the Federal Polytechnic Institute of Zurich (Switzerland) and his BSEE degree from the University of Buffalo, New York. He joined IBM in 1952 as a technical engineer and worked on the development of IBM's first computers.

During his career, among numerous professional and management responsibilities, he was the engineering manager for the AEC-sponsored STRETCH computer system. In 1962, he headed up the development of the Solid Logic Technology program which provided IBM with the semiconductor technology for IBM's System/360 series.

In 1968, he became Director of IBM's Poughkeepsie laboratory and Director of Large System Development; and, in 1970, he became Vice President, Operations, IBM Components Division, with responsibility for the development and manufacture of all IBM's semiconductor efforts. He then served on IBM's Corporate Staff as Director of Technology and Systems and as a Member of the Corporate Technical Committee.

Subsequently, he was a Vice President of the Data Systems Division and East Fishkill General Manager. East Fishkill is responsible for the development and manufacture of semiconductor logic and memory components used in most of IBM's product line.

Before assuming his present position, he was Assistant Group Executive-Technology for the Data Processing Product Group providing group-wide direction to IBM's technology development and manufacturing.

Today, Mr. Bloch is IBM vice president of technical personnel development, responsible for promoting the technical vitality of IBM's professional engineering, programming, technology and scientific communities throughout the world, and for enhancing the exchange of technical information among the company's laboratories and its business units.

He is an IEEE Fellow; a member of the IEEE Computer Society; and a member of the National Academy of Engineering. He is on the Board of Directors of the Semiconductor Industry Association (SIA) and is the chairman of the Semiconductor Research Cooperative (SRC).

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April 1983

PREPARED STATEMENT OF ERICH BLOCH, CHAIRMAN, SEMICONDUCTOR RESEARCH COOPERATIVE

I am Erich Bloch, Vice President for Technical Personnel Development, IBM Corporation. But I am here today to speak as a board member of the Semiconductor Industry Association (SIA) and as chairman of the Semiconductor Research Cooperative (SRC), a subsidiary of the SIA devoted to cooperative research through the pooling of industry resources.

I am grateful for the opportunity to appear before this committee to describe the reasons for the SRC endeavor, because I believe strongly that it is a successful prototype for other U.S. industry sectors.

I intend to cover the rationale leading up to the SRC, its operation and the benefits to the semiconductor industry, as well as the benefits accruing to academia and the country as a whole.

Semiconductor Industry: History & Outlook

The semiconductor industry has been in existence for only 30 years. But in this short time it has grown to a $15 billion worldwide industry. More important it is a basic industry, just as basic as steel, oil or chemicals were in the past. Its products are pervasive and are the foundation of other high technology sectors such as computers, telecommunications and instrumentation. They are also used ever more extensively in consumer products, play an increasing role in the manufacturing sector of our economy and are enhancing productivity in all of industry.

Up to five years ago, the semiconductor industry was primarily a U.S. industry, not only in innovation and new applications, but also in both demand and supply of products. By 1982, however, the U.S. semiconductor industry share of the worldwide market had eroded to 55%, while that of Japan increased to 35%. In 1983 further erosion of market share by U.S. companies is predicted.

But there is a more ominous sign: The most important product segment is that of MOS (Metal Oxide Semiconductor) memory and logic. A specific high volume logic chip such as a microprocessor (computer on a chip) is at the heart of most recent innovative applications such as personal computers, robotics and video games. Both memory and logic are interdependent from the standpoint of the manufacturing process.

While the manufacturing process for a memory chip forms the base process for logic chips, memory chip volume is a prerequisite for cost efficiency in microprocessors. Preeminence in memory, therefore, is a prerequisite to, and harbinger of, preeminence in logic and microprocessors. Yet, in 1982 the worldwide MOS sales of Japanese companies increased by 14.5%; while those of U.S. based companies increased by only 8.6%. Even in the U.S. market, Japan out- stripped U.S. companies in a sales increase of 67% vs. 17% for our domestic producers. Most of this increase came from Japanese sales of 64K memory devices. U.S. sales of semiconductors in the Japanese market is about 9.3% share of that market and is declining; whereas the Japanese share of the U.S. market is at 12.4% and growing.

Why this turn of events?

First of all, foreign countries -- in particular, Japan -- have recognized the strategic importance of the semiconductor industry.

Second, the rapid worldwide diffusion of U.S. technology and innovation has provided a base to build on.

Third, Japan has especially targeted the MOS memory products as an efficient way to achieve market share in semiconductor products and appears to be using it as an entry wedge to become a world force in semiconductors.

Fourth, Japanese industry under MITI guidance received financial support from government agencies through favorable loans and research subsidies. In addition, pooling of engineers and scientists from industry and government has fostered growth in research and development. This has resulted in investment on a greater scale than the U.S. semiconductor industry could afford to do. This, despite the fact that the investment in capital and R/D by the U.S. semiconductor industry in 1982 was 14% and 9.8% respectively, compared to 7% and 3% by U.S. industry as a whole. Japan, however, is outspending the U.S. semiconductor companies in both of these areas: 20% in capital investment and 15% in R/D spending.

Fifth, Japan has consistently provided quality products which are comparable to the best available in the U.S. This was a key strategy and essential to their market share growth. Despite important efforts and progress by the U.S. merchant semiconductor industry, there is still perception that Japan has equal or better quality.

Strategy for Semiconductor Industry

Despite the competitive challenge, the U.S. semiconductor industry is experiencing its strength, and the prime reason for its phenomenal growth can be attributed to its imaginative pursuit of research and the availability of well educated and experienced scientists and engineers. This research has led to the rapid generation of new, rapidly evolving technologies and new processes. In turn, these new processes have led to a continuous flow of new products.

Innovation and new research results are generated daily and the growth of the past will be overshadowed by future growth -- provided the pursuit of research continues.

In order to cope with increasing competition in the world market, the semiconductor industry must increase its efforts in research and development. At the same time, the research tasks are becoming more complex and more capital intensive; lead time is increasing and the shortages of sufficiently trained manpower make the staffing of needed projects difficult.

For all these reasons, some research efforts are beyond the affordability of individual companies. In addition, the approach of the past and the present, where each company performs its independent research, causes much overlap and duplication of effort.

The U.S. Semiconductor Industry's Answer

Faced with increasing competition from abroad and realizing that research is the foundation of its future well-being, the U.S. semiconductor industry two years ago established the Semiconductor Research Cooperative (SRC) to increase much needed research effort.

The cooperative is accomplishing this by drawing on an important, but underutilized resource: the nation's universities.

By pooling funds and contracting for priority projects to the research universities, industry is accomplishing important objectives:

- increasing semiconductor research in the United States;
- sharing results among member companies and avoiding duplication of effort;
- providing research opportunities and upgrading laboratories in the universities.

- attracting more students to this vital field of study and improving the quality of education.

Today this cooperative is functioning. In 1982 about five million dollars was committed to this effort by participating companies. In 1983 the commitment exceeds 11M dollars.

This commitment adds significantly to the basic research effort in semiconductors. While the total semiconductor R/D spending of U.S. industry is large (in excess of $500M), most of it is for development and applied research. It is estimated that less than 5% is applied to basic research. Further, the total semiconductor research of National Science Foundation is approximately $8M.

It is clear from these goals that the focus is on research, rather than development. While the research results accrue to all participants, each in turn must apply the results separately and independently to develop its own products for the world marketplace.

Joining in this kind of basic research does not inhibit fierce competition in the marketplace. Much development needs to be done by each company before a product is readied for market. To the ingenious and the swift will accrue the fruits of this research.

The companies that participate in this effort are merchant semiconductor companies (companies that sell semiconductor components in the marketplace) and companies that manufacture semiconductors for their own use. The latter group are computer companies, instrument makers, manufacturers of communications equipment. Equipment and materials manufacturers that supply the semiconductor industry are also participants.

To date, 18 companies have joined this activity and another 12 companies have expressed great interest. The companies range from very large (Motorola, IBM, GE, Honeywell) to medium ones (CDC, DEC, Intel, AMD, H/P) to small ones (Silicon Systems, Monolithic Memories), to cite a representative sample.

The common goal among all these companies is the furtherance of this important technology and the pursuit of innovation. They realize that a viable domestic semiconductor industry is a prerequisite not only for the industries in which these companies operate but also for a nation desiring to be a leader in technology.

At present, the SRC has entered into 50 contracts with 30 private and state universities. Some contracts are major research thrusts on a broad basis and provide for work that will be conducted over many years with major universities participating -- and at times cooperating -- among themselves.

Contracts have been carefully apportioned between known, less well known and other universities. This should help signigficiantly to upgrade the quality of the participating universities to achieve premier status.

One hundred academic researchers and 125 graduate students are now supported by these contracts.

The SRC is considering extending its mission into areas other than pure research. In particular, the industry requires focus on manufacturing automation, productivity improvements and manufacturing quality. Combining the research work of universities with demonstration manufacturing facilities would allow the industry to solve basic problems and develop products that, under normal circumstances, would not be available for use until much later in time.

Specifically, the SRC is considering a pilot program of process definition and advanced design for a four megabit memory chip. This could leapfrog the normal development cycle; bring together in one place the critical mass for such an effort; and demonstrate the manufacturability and reliability of such a device.

A combination of resources could be brought to this task:

- Venture capital for the R/D portion of the project;
- Skill and expertise from the industry and universities;
- a demanding leading edge requirement, manufacturing funding and an early usage for defense requirements;
- licensing of the design and process to the U.S. semiconductor industry for commercial exploitation.

What Congress Can Do

Congress can be instrumental in supporting the SRC and through it maintain a viable U.S. semiconductor industry by

(a) assuring the continuation of the R/D tax credit beyond its 1986 expiration date;

(b) liberalizing the credit for industry funded university research. Today, the provision is for a 25% tax credit on increases over the previous three-year average base. The 25% tax credit should be applied to all industry funds in support of university research.

(c) clarifying and liberalizing the antitrust laws to permit joint research efforts, where the sharing of results does not inhibit product competition in the marketplace.

(d) Taking cognizance of our technical skill shortages by allowing foreign students attending U.S. universities to enter the U.S. workforce if their studies are in disciplines where shortages exist.

Other Semiconductor Industry Initiatives

The Semiconductor Industry Association and its member companies have undertaken other initiatives to counteract the competitive threat it faces.

First, the industry recognized early that it must take the initiative and deal with its challenges through internally generated action. The contrast is striking when viewed against other industries that either did not react at all or waited until it was too late to deal with an external challenge.

Second, the industry does not favor protectionism, which invites retaliation but asks instead that the U.S. government actively seek to influence other countries to make their markets as open and available to U.S. companies as U.S. markets are to their companies. This kind of opportunity does not exist today -- certainly not in Japan and Europe -- despite the requirements of the Gatt national treatment articles.

Third, the semiconductor industry wants equal access to resources of other countries: Capital access and the right to invest and establish factories and acquire local companies. It also does not want to be inhibited by unilateral trade restrictions, differential duties and local content legislation. It has a continuing dialogue with the U.S. Trade Representative and appropriate committees and members of Congress to explain and support these objectives.

Fourth, SIA has been active in supporting legislation on trade, tariff, taxes, export control, antitrust and copyright to provide a national climate more conducive to the operation of high technology industry.

Summary

I hope I have shed some light on the reasons and activities of the SRC. Thank you for giving me the opportunity to discuss this important undertaking with you. It not only benefits the semiconductor industry, but all of U.S. industry and the whole U.S. economy.

Mr. **Walgren**. Thank you very much.

Let me share with Mr. MacKay and other members the opportunity to discuss this with you. Since Admiral Inman has a time problem, I will perhaps focus there first.

You indicated you felt that the focusing and development of a talent on the leading edge need not necessarily be government driven or government funded. I don't know how much of a limitation you would feel on that but that you expressed the need for supportive policies on behalf of the Government. Can I ask you whether there is a range of supportive policies that you feel would be helpful and sufficient or where do you see the Government operating of necessity in this area in order to be successful?

Admiral **Inman**. Mr. Chairman, I believe there are a series of actions, some very near-term and others that will require some consistency over a long period of time. Clearly early on clarification of the antitrust laws to, in fact, encourage joint research ventures would be a signal that I think would cause substantial movement in other industries as well as this one.

Over a slightly longer term, coincident with this kind of change is incorporating in the law with stability over a long period incentives. The tax R&D credit should become permanent. It clearly should include software development as a part of that. As one who has spent billions of U.S. taxpayers' money in buying major surveillance systems and processing systems for the Government, the hardware systems did not work the first time but it usually always did on the second. We were usually lucky if we got the software right about the third time so there is a tremendous amount of R&D activity there and it clearly should be included in the definition and by draft IRS ruling right now it would not be.

I think as one turns to the other industries not pertinent to the one that is here today that you are going to need to address some substantial acceleration and depreciation circumstances to insure modernization in some of the basic industries. R&D alone will not be enough to insure that they are able to be competitive at the international marketplace.

We do have to keep in focus in all of this that it is an international marketplace, that international trade is now an integral part of our national security and we need to understand it that way and that it becomes an effective tool of holding together alliances and guiding that competition in the world as long as we are leading the technology. If we are not, then the instincts to throw up barriers, to get into trade wars and to break up alliances is the far more likely prospect.

Finally, let me venture away out on this question and that is the question of education. How does one encourage an acceleration on our own part of investment in graduate education and in focusing research on fields that may not have a commercial role.

It is particularly in the latter one where I think the Government has the critical role. It is clear that there may well be needs of the Government in the way of performance in computers that are beyond the requirements that are likely to develop the commercial market. In that case the Government clearly should broaden, expand on the research that would be funded by the private sector.

On the question of education, Admiral Inman's personal preference is for tax credits to corporations for grants for graduate education. As an approach that does not, in fact, require additional Federal Government management but would give the incentive to industry for what they ought in self-interest to be doing in any case and some industries are, enhancing the graduate aid funds available to attract youngsters who have been working hard for 4 years who have got a bill already piling up for their undergraduate education and they see that salary for their BSEE is very attractive. Grants would do a lot, I believe, to insure that the best of the undergraduates are staying on for the additional 3 to 4 years which, in the long term, would be a great investment in this country's competitive capability.

Mr. WALGREN. Let me give the other panelists an opportunity to just talk generally about what limitations on Government as a direct act that you feel might be appropriate. Perhaps that is the negative expression. What is the potential of Government as a direct actor and what is it not?

Mr. BROOKS. Well, clearly I think that in the case of basic research which has a very large what I would call positive externalty in the sense that the benefits of basic research are widely shared. Throughout the economy the Government has got to continue to bear a major share of responsibility but I agree very much with the proposals that Admiral Inman has made to the degree that one can enhance and encourage industrial support in certain areas where, in fact, if incentives are clear enough for industry to do it, we should take advantage of that but I think there would be a danger if we think that is going to substitute for the Government's support because, in fact, I think one of our great strengths has lain in the very broad coverage of fields. In the 1960's a lot of critics were saying that the NIH was wasting a lot of money on molecular biology just to satisfy the curiousity of a bunch of scientists and all of a sudden we have a new industry based on that. If we had not been developing that field over a period of 20 or 30 years we would not have had the basis for this new industry. So, the Government has got to continue to play that role.

Mr. LACEY. I had just one additional thought, Mr. Chairman.

I agree with all that Admiral Inman and Dr. Brooks said. The thought touches on the long-term research and educational aspects that Admiral Inman talked about and it has to do with equipment for research. Much of the equipment in today's universities is obsolescent and we are training our graduate students in that mode. One example, and it is only one example that happens to be in the field that I understand. There is a significantly greater density of supercomputers outside the United States in academic institutions than in the United States. To my knowledge there are only three supercomputers in U.S. universities today. One at Purdue, one at the University of Minnesota, and one at Colorado State University and even those are underutilized through lack of funds.

Mr. WALGREN. Congressman MacKay.

Mr. MACKAY. It seems to me that you gentlemen, each in your own way are in the forefront of thinking through the implications of a new perception of reality. We are in world competition and you are saying, basically, that there are some impediments to our ability to compete would come about because the laws are designed to govern competition in this old perception. So, you are saying the role of the competitors, competing private sector institutions is changing and we have got to change the laws to upgrade that. Now, I want to ask the counterpart question, is the role of Goverment changing? Is the relationship between the public and private sector institutions changing? Should we look at Government as more than a passive partner? We are a partner in the sense that the credit means we are putting up half the money, not saying what happens to it. We are just putting up half the money. Should we now be saying that we want a quid pro quo for our half of the money in the sense that we think you are not paying enough attention to upgrading the training of your engineers? We think you are not paying enough attention to the needs of higher education institutions and in order to get us to participate you have got to pull a different share of the load. Have you given any thought to that? Should we be looking at ourselves as joint venturers and saying to you, if you want to play we are willing or should we require you to pay a minor royalty on everything that comes out of this new research? In other words if we change the antitrust laws should you have to pay a minor royalty on anything profitable that comes out of it which will fund basic research in the future? Have you given any thought to that or do you think those are ideas that flow naturally from rethinking these relationships?

Admiral INMAN. Mr. MacKay, I would like to think about that a little and respond to the committee perhaps in writing. Instinctively from my 30 years of Government service, I am not inclined to see the Government try to pick up a role to manage because I don't know who would do it or who would do it effectively. I think ineffective efforts to manage it would be worse than even the situation we have now.

On the other hand, on the question how does one accelerate the funding of basic research, that part of the question I would want to think about and respond thoughtfully. And if I may suggest to the committee, a prospective witness for one of your hearings, Dr. George Kozmetsky, the former head of the School of Business at the University of Texas, now the head of the Center for Creative Business Initiatives. He has studied a great deal of what contributed in the way of partnership, Government, academic, business to the great boom in the forties and fifties and what happened to that.

Mr. MACKAY. I have this feeling that Government research dollars in some ways are counterproductive to good teaching in universities which is a shame. The best innovative guys who are trying to help themselves careerwise have got to do research which means they have got to get out of the classroom or they say they have. The State government cannot deal with it because it is Federal money that is driving it and I am wondering if, perhaps, you might not set up a trust funded with some of the royalties out of the flow from profits out of basic research and that trust could be used to provide incentives for good teaching in universities.

Do you see that as part of this problem? I can tell you State level legislators see it as a major part.

Mr. BLOCH. If I may comment on it just like the admiral, I don't want to shoot from the hip and would rather think about your question in a little bit more detail but let me just make a couple of points.

I think the research component in the university is an important aspect of teaching and separating the two, I think can hurt only teaching and not help research.

Mr. MACKAY. Do you agree that Government research dollars tend to separate the two?

Mr. BLOCH. No; I would not say so. I would say primarily that if one could make it easier to obtain Government research dollars instead of going through prolonged kinds of applications and evaluations and so forth then I think it would be more effective. But, I would not think that it is a decisive kind of a mechanism.

Admiral INMAN. My perception, Mr. MacKay and again it may not be right is that what really has happened here in the sixties and seventies is a couple of activities that have been very counterproductive. One was trying to focus so specifically the Government investment tied to weapons systems and other things that we, in fact, neglected the much broader based funding and basic research that had occurred earlier largely through the auspices of the Department of Defense.

Second, the other part of it has been the attitude of the universities themselves and it reflected the Vietnam crisis and the time that followed and the desire to keep great distance both from Government and industry for the sake of academic freedom and purity.

That is being rethought at a lot of universities and one of the exciting things I found was a very dramatic shift on a number of very forward-looking leaders with emphasis on creating the kind of mechanisms that protect academic freedom on the one side but facilitate working with industry and the Government on the other hand.

Mr. MacKay. Mr. Chairman, if I might have one other question.

I thought you were going ot say something different, Admiral Inman. I thought you were going to say that one of the mistakes was in the sudden gearing up of the university system to compete with the Soviets and then once they were geared up the backing off. In other words, the driving of U.S. education policy in a negative way, we have got to do this to compete with the Soviets and I thought you were then going to say we ought to be careful not to do that again with the desire to compete.

Admiral Inman. I think we have to approach the investment at the academic level as the great place where one tries to find new ideas without being tied to threats. But as one looks back, 1862, the Morrill Act in the middle of a war was the first great move toward industrialization in this country and what it produced. And the second was the collaboration with Government and industry during World War II. There it was the perceived real threat but that carried us on through the next 15 years. It was when we came to the space race that we began to focus but also in the interest of being cost effective most of the defense funding was tied down. It had to be tied to a direct weapon system and I think there is where we went awry on the question of basic research investment.

Mr. Walgren. We may have some short additional questions in writing if you all would be willing to respond to those it would be helpful to us.

I would like to thank each one of you as witnesses on our first panel for the contribution you have made. Thank you very much. Good luck to you.

Our second panel is made up of Mr. Allan I. Mendelowitz, Associate Director of the General Accounting Office. Dr. John Zysman with the University of California, Berkeley, and Mr. Joji Arai, director of the Japan Productivity Center.

Gentlemen, if you could come forward to the witness table and join us we would appreciate it.

Let me thank each one of you for coming to join us in these hearings. We appreciate your presence and without objection, your prepared statements will be included in the record.

Mr. Mendelowitz, if you would kick off this panel, we would appreciate it.

STATEMENT OF ALLAN I. MENDELOWITZ, ASSOCIATE DIRECTOR, GENERAL ACCOUNTING OFFICE

Mr. Mendelowitz. Thank you, Mr. Chairman.

I would be very happy to briefly summarize my statement and include the full statement in the written record.

We are happy to be here today to discuss two GAO reports issued over the past year, one entitled "Industrial Policy, Japan's Flexible Approach," and second, "Industrial Policy Case Studies in the Japanese Experience."

What we did in the work underlying these reports was to examine in an overview way Japanese industrial policy since the Second World War. We looked at how industrial policy was integrated and conformed with macroeconomic objectives and implementation and then undertook case studies of five Japanese industries, three of which could be categorized as high technology emerging industries and two of which are declining industries.

What we found in our study were several interesting aspects of industrial policy which are worth noting. One is that the single word that probably best characterizes Japanese industrial policy is the descriptive term flexibility. This flexibility is evidenced both in the type of objectives adopted as the goals of industrial policy and in the instruments used to achieve these goals.

In terms of objectives in the early postwar period, Japan set out to rebuild a war shattered economy which meant rebuilding basic industry. When basic industry was rebuilt industrial policy objectives centered on catching up with the technology of the West. Now that the Japanese economy has reached parity in a technological sense with the United States and Western Europe the objectives are in pushing out the frontier of knowledge and moving to an advanced technology-intensive and knowledge-intensive economy.

In terms of the operation of industrial policy within the broader context of policy in Japan, we found that there was a tremendous amount of mutual reinforcing implications for the way policy was developed. This applied to the way macroeconomic policy contributed to the objectives of industrial policy and the way industrial policy contributed to the objectives of macroeconomic policy.

The planning process in Japan starts out at the macro level with broad economy-wide goals being specified and then works its way down to the industry level where objectives for individual industries are developed in concert and consistent with the goals of macropolicy.

With respect to the three developing emerging industries that we looked at there was the computer industry, the aircraft industry, and the robotics industry and we found that each of these three case studies were dramatic examples of the flexibility in both goals and instruments. In the case of the aircraft industry, what the Japanese Government did because of the nature of the industry, the world market, the Japanese market, et cetera, was to assist in the development of the Japanese civil aircraft industry by first promoting the development of the military industry through coproduction agreements which provided necessary experience in aircraft production and assembly and developed an inventory of capital equipment for aircraft production. After some unfortunate and unsuccessful attempts to promote the aircraft industry in the 1960's, the Government moved into supporting Japanese coparticipation in international joint research, development and production ventures.

So, the Japanese aircraft companies are currently involved in efforts to jointly develop with United States and English companies jet aircraft engines and they are currently a 15-percent risk-sharing partner in the Boeing 767 program.

In the case of the computer industry, we currently find the Japanese Government essentially trying to push out the knowledge frontier by supporting with substantial funds a high-speed computer project and artificial intelligence projects.

In the case of robotics what we found was that the industry itself was ahead of the Government in terms of getting involved with developing products and production capability. The interesting thing about robotics was that when the Government did get involved and recognized the great contributions that robotics could make to the development of a productive, high value added knowledge-intensive economy, the Government intervened to assist primarily in the infusion of robotics in the economy through tax credits, government credit and the creation of a leasing company to facilitate the diffusion of robotics to small- and medium-sized firms.

I think the final point I would like to make about Government involvement in Japanese industry with respect to the high technology sector of the economy is that Japan has supported two activities which we should be very careful to recognize. One is they support research and development through grants, credits, and antitrust immunity for joint ventures.

But in addition, they have undertaken a very considered and very conscious effort to diffuse the fruits of this research and development throughout the economy so that you find the benefits of the research and development being very quickly spread throughout the society and assisted by Government aid in the form of tax credits, special depreciation and Government-supported leasing operations which facilitate the acquisition of this type of new technology equipment in the Japanese economy.

This concludes my summary comments and I would be happy to answer any questions at your pleasure.

[The prepared statement of Mr. Mendelowitz follows:]

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

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STATEMENT OF

ALLAN I. MENDELOWITZ
ASSOCIATE DIRECTOR, NSIAD

BEFORE THE
HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

SUBCOMMITTEES ON OVERSIGHT AND INVESTIGATIONS
AND
SCIENCE, RESEARCH AND TECHNOLOGY

ON

JAPANESE INDUSTRIAL POLICY

Mr. Chairmen and Members of the Subcommittees:

We are pleased to be here today to discuss with you our reports "Industrial Policy: Japan's Flexible Approach" (ID-82-32), and "Industrial Policy: Case Studies in the Japanese Experience" (GAO/ID-83-11). We would like to address several points in these reports which we believe are of interest to the Subcommittees. Our work traced the development of industrial policy in Japan since World War II and attempts to describe the changes in the goals adopted and tools used. In addition, we discussed how monetary and fiscal policies have contributed to achieving the goals of industrial policy.

Numerous political, social, and economic factors contribute to the performance of the Japanese economy. For example, Japan undoubtedly benefits from its well-educated, highly-motivated workforce, and a homogeneous population. In the business sector, management in many firms has encouraged worker contribution to quality control and productivity and has a reputation for making decisions on the basis of their long-term impact rather than their short-term contribution to profits. Moreover, in the political arena, the uninterrupted rule of one party since World War II has contributed consistency to policy making. Because these and other factors must be taken into account, any assessment of the contribution of industrial policy to Japan's economic success is at best difficult, and was beyond the scope of our work.

JAPAN'S APPROACH TO FASHIONING INDUSTRIAL POLICY

In our studies, we found a high degree of integration and complementarity between macroeconomic monetary and fiscal policies and microeconomic industrial policies. Integration of macro and microeconomic policies has meant they mutually reinforce and complement each other in achieving overall national economic goals. We also found that formulation and implementation of Japanese industrial policy has been characterized by a high degree of flexibility. This flexibility is evident in the way the Government of Japan has changed goals and policy instruments in response to changing domestic and international economic and political circumstances.

The planning process in Japan begins with the setting of yearly macroeconomic goals and long-term objectives for the economy and society by the Economic Planning Agency (EPA). These goals receive official standing when they are endorsed by the Cabinet and form the basis of a national consensus on the direction in which the economy should move. In addition, EPA forecasts general macroeconomic conditions.

The Ministry of International Trade and Industry (MITI) and its Industrial Structure Council develop industry goals that are consistent with the macroeconomic goals. On the basis of these more specific goals, industrial policies are formulated and implemented. The Industrial Structure Council represents many diverse interests, e.g., business, labor, academia, and so on, and an effort is made to achieve broad support for the policy objectives. The goal-setting process both at the macro and microeconomic levels, is a major contributor to consensus-formation. Albeit difficult and time consuming, the government attempts through these efforts to gain broad support for the direction and nature of such goals and policies.

The widely accepted consensus in Japan from World War II through the early 1970s strongly supported government efforts to reconstruct the Japanese economy by rebuilding the nation's basic industries and by working to catch up with the technology of the United States and Western Europe. Following the economic turbulence of the early 1970s and the resultant increasing and often conflicting demands placed on the government, consensus has become more difficult to achieve. Japan's recent goals have focused on adjusting to stable growth, encouraging resource conservation, improving the environment, and supporting the development of higher value added, technology-intensive production.

INDUSTRIAL POLICY INSTRUMENTS

Policy instruments in the post-war period

In the early postwar period, Japan marshalled a large array of industrial policy tools which enabled the government to strongly influence the rate and direction of economic growth. These tools included

--strict foreign exchange controls;

--commercial policies which gave incentives to exports and restricted imports; and

--controls over foreign investment and the acquisition of technology.

For example, foreign exchange controls were used to direct resources to targeted industries and to limit foreign competition in the domestic market. The Foreign Exchange and Foreign Trade Control Law operated through a system consisting of a foreign exchange budget and import controls. The foreign exchange budget set the amount of foreign currency available for the year and allocated it among sectors of the economy. This enabled the government to effectively allocate foreign exchange and, thereby, to direct raw material imports and the acquisition of foreign technology to targeted sectors such as steel and chemicals. During this period, the government protected domestic industry by carefully restricting competition from imports and foreign industry through the use of import controls and controls over foreign investment in Japan.

Monetary and fiscal policies reinforced the effectiveness of these tools in a number of ways, primarily by

--keeping interest rates low, thereby lowering the cost of investment;

--maintaining a balanced budget and government spending at a modest share of gross national product; and

--administering a tax system which favored savings and investment.

By restricting financial markets so that they did not become a major source of free capital the government was able to keep interest rates artificially low, and effectively control which industries had access to Japan's limited capital. Firms were largely dependent upon Japan's 13 major city banks for financing industrial development. The city banks, in turn, were dependent upon the Bank of Japan in order to expand their loanable funds. This interrelationship enabled monetary authorities to effectively ration credit through the city banks to targeted growth sectors. Non-targeted sectors were denied access to this credit.

Fiscal authorities also allocated budgetary funds to support targeted industries. Funding came from tax revenues and the proceeds of government bond issues. Because of a commitment to sound finance principles, the only government debt incurred prior to the early 1970s was for productive investment. These bond revenues were primarily used to support the development of infrastructure. Household savings were also allocated by the government. These savings were primarily deposited in the nation's post offices, and were channeled by the Ministry of Finance to the Fiscal Investment and Loan Program (FILP). The funds were in turn allocated to local governments, government corporations and government financial institutions, such as the Japan Development Bank and Japan's Export-Import Bank, to implement government economic policy goals. Significant funds from the FILP were thus allocated to targeted industrial sectors to stimulate industrial development. The FILP account has been as large as 50 percent of Japan's national budget and thus has accounted for significant assistance to Japanese industry.

Recent policy instruments reflect changes in domestic and international realities

As we noted, a key feature of Japanese industrial policy has been its flexibility in responding to changes in the domestic and international economies. Since the early 1970s, these changes have included the growth of a number of successful and internationally competitive industries, growth rates which are high relative to those in many other industrialized countries, increasing trade friction with developed nations, competition from newly industrializing countries, and economic difficulties resulting from the oil crises. Coupled with these changes, high government deficits and high consumer and energy prices have contributed to increasing difficulties in decisionmaking and in achieving consensus.

These changes as well as the loss of many of the post-war tools of industrial policy have altered the government's involvement with industry. A rising class of structurally depressed industries, a number of which are energy-intensive, has led to new legislation and increasing government involvement in easing the adjustment process. In the case of mature industries, the Japanese Government finds itself attempting to restrain competitive Japanese exports. At the same time,in the growth sectors, the government is supporting, through various measures, the development of leading-edge technologies. Another element of industrial policy important to the economy as a whole is the government's support for diffusion of technological advances.

Today, the Ministry of International Trade and Industry continues to influence government and industry views concerning the direction of industrial development through administrative guidance, incentives, and control. In the case of emerging industries government influence is based largely on incentives; whereas, the government has more direct influence over declining industries.

The Japanese government, through its industrial policies, reduces the risks inherent in high technology research and development and makes investment in this area more attractive to industry. The government, directly or through government banks (e.g., the Japan Development Bank), provides seed money for various industry research and development projects defined to be within the parameters of national goals. Perhaps the most beneficial side effect of this support is that firms receiving such support are viewed as good credit risks by commercial institutions and their access to debt and equity is improved.

In addition to financial assistance, government support also comes in the form of waivers from the anti-monopoly law of Japan for approved joint activities. Under the 1971 and 1978 temporary laws promoting the electronics and machineries industries, MITI was given the authority to exempt certain activities from the anti-monopoly law. During the earlier period, MITI emphasized mergers. MITI for the most part, was unable to effect these mergers and turned its attention in the later period to encouraging joint activities. Consultations between MITI, the industry and the Japan Fair Trade Commission (which performs functions similar to the Department of Justice's Antitrust Division and the U.S. Federal Trade Commission) determine the nature, participation and duration of cooperative ventures. Such ventures permit companies to work cooperatively in R&D endeavors and avoid duplicative investment on the part of an industry. Again, risk associated with sophisticated R&D is substantially reduced through this mechanism.

Another form of assistance is the use of tax deductions, credits, and special depreciation allowances to reduce the cost of development and diffusion of high technology products. Tax credits of up to 10 percent of corporate taxes are available for investment in new R&D facilities and equipment. Accelerated depreciation is allowed for facilities used to produce technologies approved by MITI. Other special depreciation allowances are available for certain machinery and equipment which embodies advanced technologies. Deductions from taxable income are permitted for income received from the export of technologies or technical services.

In addition to tax measures, the government also attempts to promote diffusion of high technology products through its creation and support of special leasing companies. These two measures assist both developers and potential users of more modern and technologically advanced products and processes. For producers, developmental risks are reduced because market development has been assisted; and for users, high-cost, sophisticated equipment becomes more affordable and product innovation more accesible.

Government assistance to declining industries is similar. Loans or loan guarantees are offered to companies to encourage scrapping or mothballing of equipment. Exemptions from the antimonopoly law are granted by MITI and the Japan Fair Trade Commission to facilitate capacity reductions and other industry rationalization measures through joint agreements. Finally, tax breaks are given to companies which upgrade and modernize plant and equipment to improve productivity. The Japanese response to declining industries is a coordinated approach involving contractual obligations between industry, government, and labor, concerning shifts of resources and tying of industrial adjustment to worker and community adjustment. Equally important in this response is the conscious effort of the government to integrate incentives to growth sectors with policies for adjustment in depressed industries and regions. These policies include assistance for worker retraining and relocation of industry and workers.

INDUSTRIAL POLICY: CONTRIBUTIONS TO SPECIFIC INDUSTRIES

To illustrate our discussion on the mechanics of industrial policy in growth industries, we studied computers, aircraft, and robotics. Segments of each of these industries meet criteria enumerated in the government's overall economic goals, that is,- they embody high value added or contribute to productivity or quality improvements in the Japanese economy or society as a whole. Industrial policy for these industries is implemented within a framework of temporary laws which promote electronics and machinery industries. These laws have allowed MITI to direct certain activities under exemptions from Japan's anti-monopoly law. A loosely constructed administrative framework composed of numerous government and industry groups provides coordination for policy implementation. As we noted earlier, the major policy tools in use today are joint industry-government programs for research and development of indigenous technology, and tax and other measures for the development and diffusion of technology. The importance of government sponsored R&D projects varies in significance for these three industries, as dicussed below.

The computer industry

Government involvement in the computer industry began in the very early stages of its development in the 1950s and has varied in type of assistance and in importance over time.

Government supported actions have:

--Established an institutional structure and legal framework for developing and implementing policies.

--Guaranteed a market for Japanese producers through commercial policies that limited imports and foreign investment and emphasized "buy Japanese" policies.

--Funded a leasing organization which ensured that Japanese manufacturers would be domestically competitive with International Business Machines, Inc. (IBM).

--Provided tax benefits.

--Provided success conditional loans for development and production of directly applicable commercial technologies. And,

--Fully subsidized R&D projects for basic and leading edge technologies.

The underlying approach to the computer industry today was set out in a 1981 report of the Industrial Structure Council's Information Industry Committee. The report outlined the importance of the computer industry. First, the industry itself represents a high value-added and low resource and energy use industry. Second, the computer industry and related information processing industries form the basis of Japan's drive toward a "creative, knowledge intensive industrial structure of the 1980s."

Historically, the changing nature of government assistance to the computer industry reflects the flexibility of Japan's approach to industrial policies. Early manufacturers faced formidable and established competitors and lacked production facilities and access to existing technologies. Government assistance concentrated on loans to manufacturers to support investments in plant and equipment for commercial production, support for licensing agreements between Japanese and U.S. firms to gain access to technology, and commercial policies to protect domestic manufacturers from foreign competition.

As Japanese firms began exporting and international pressures forced Japan to limit its protective commercial policies, government assistance began to focus on aligning domestic manufacturers in R&D efforts and providing funds for the development of commercial products. As manufacturers have approached technological parity with international competitors, a further shift has occurred in government policy. The government currently provides full grant funding for a number of projects in which private companies participate to develop state-of-the-art technology.

These policies were developed and implemented by the government in consultation with various advisory councils and specialized industry associations representing a wide range of producers and users.

Civil aircraft industry

This industry fits the profile of industries the government believes are necessary for the future health of the Japanese economy; it is a high value-added industry, and advances in sophisticated technologies have potential application in other industries. Several industry associations, MITI's aircraft bureau, and the Industrial Structure Council's Aircraft Subcommittee coordinate policies and advise the government on projects to be undertaken in the field of civil aircraft.

Infant industry development techniques which employ protective commercial policies could not be used for the civil aircraft industry because the domestic market is too small to provide sufficient demand needed to achieve economies of scale.

Initial efforts to rebuild Japan's aircraft industry began with government support for maintenance, repair and the licensed production of military aircraft. Military production still accounts for the bulk of Japan's aircraft production and has provided important spin-offs for Japan's civil aircraft programs.

The government entered the civilian aircraft production field in 1958 with the creation of a 50-50 public-private joint venture manufacturing corporation to manufacture the YS-11 civil transport aircraft. The plane was a technological success but a commercial failure. As a result, the government's initial approach to supporting civil aircraft was significantly revised and it was decided that sales, marketing, and commercial production of aircraft should be handled by the companies alone. However, the government continued to believe that research and development in this field was too large an undertaking for private companies individually or even in cooperative joint ventures.

Government support for the industry now focuses on assisting the industry's participation in the R&D phase of international joint ventures. Two major projects to date have been a joint venture with Rolls Royce to develop an aircraft engine and a joint venture with Boeing for the 767 aircraft. Tentative planning is underway to participate in the development of a 150-seat jet transport aircraft. Government funding for these projects takes the form of success-conditional loans;i.e. the companies are required to repay loans only when the projects are commercially successful.

In addition to financial and administrative support for prototype development, the government provides funds for basic research in new technologies. Such projects include the use of optical fibers in avionic systems and aerodynamic studies to improve fuel efficiency. Part of MITI's major project to develop technologies needed for the next generation of industries will be the development of new composite materials which have important ramifications for the development of new aircraft.

The emerging steel-collar work force: robots

Growth of the Japanese robotics industry began in the mid-1970s and was spurred by the prospect of labor shortages. This industry developed with little or no government assistance until the late 1970s, when the government officially recognized the industrial robot as a means of boosting productivity, lowering labor and material costs, and improving product quality. Government involvement in this industry has been directed mainly toward expanding the use of robots in small- and medium-sized enterprises. There has also been some support for basic research and development.

Robotics represents an interesting departure from earlier industries receiving government assistance because it is a new industry worldwide. New technologies are being developed and new markets created. Japan is not faced with catching up to an existing mature technology or in gaining sales by increasing its share of already established world markets.

Research and development in the robotics industry is conducted by (1) universities, (2) public research institutions, and (3) private companies. Public research has concentrated on basic research and theoretical problems such as vision and sensory perceptions. The government's attempt to set up a national, long-term research effort was postponed repeatedly because of budgetary constraints. It now appears that it will be funded at about $70 million with the goal of developing an intelligent robot by 1990.

Private research in Japan has been by far the more extensive, and has focused on research and development most closely linked to applications. Three types of companies have become involved in robotics, spurred in large part by the same concerns of costs, quality, and productivity. The first type consists of a number of large corporations, including Kawasaki, Mitsubishi, and Hitachi,in which robotics comprise a very small part of corporate production and sales. Producers of numerically controlled machine tools or large manufacturing systems, such as Fujitsu Fanuc, make up the second type; and companies that originally produced special purpose robots for their own use comprise the third type.

To encourage the diffusion of robots, the Japanese Government supported the establishment of a leasing company (the Japan Robot Leasing Company--JAROL) in April 1980 to lease robots to small- and medium-sized firms. The initial capital was provided by 24 robot producers, 7 general leasing companies, two of Japan's private long-term lenders, various city banks,and low interest loans from the Japan Development Bank. JAROL is now attempting to expand its operations to begin leasing robots to foreign customers.

Tax incentives and government credit are also used to promote diffusion of robots. These have taken the form of low-interest loans provided by government banks, loans from local governments, and special depreciation allowances. The Small

Business Finance Corporation and the People's Public Finance Corporation are providing low-interest, long-term loans to small- and medium-sized enterprises for the installation of robots to enhance occupational safety. Similarly, central and regional governments have set up a fund for these firms to purchase or lease robots for modernization. Finally, manufacturers who install robots are eligible for special depreciation allowances provided by the government in addition to ordinary depreciation allowances. According to our information, a user could depreciate as much as 52.5 percent of the initial purchase price in the first year.

EFFECTS OF INDUSTRIAL POLICY ON GROWTH: SOME OBSERVATIONS

One facet of industrial policy has been Japan's ability to tailor different policies to different industries at different points in time. This has been accompanied by changes in the government's influence over the direction of growth. Early government tools such as control over foreign exchange allocations, have been replaced by programs which most often rely on incentives. Within this context, government support for individual industries has been tailored to meet the specific needs and objectives of a given industry.

In the computer industry, as new technologies become increasingly important for competitiveness, and company access to capital improves, manufacturers conduct more of their own research and development. Most of the companies participating in MITI's highspeed scientific computer project, for example, have separate, similar projects underway. On the other hand, in the aircraft industry, where research and development is a very costly undertaking and the domestic market is too small to provide sufficient demand for new products, the government supported international collaboration in research and development. In robotics, government involvement trailed industry development, and diffusion of technology to small and medium-sized firms has been the most important form of government assistance.

A significant aspect of Japan's industrial policy toward emerging industries lies in government support for the development of leading-edge technologies as well as support for the diffusion of advanced technology throughout the economy. The industries receiving support, therefore, are important not only in and of themselves but also for improving the performance and productivity of the economy as a whole. Direct subsidies to joint industry government R&D projects and tax credits for research and development help to provide the resources to develop new technology. Recognizing that the contribution of new technology depends on how quickly and widely it spreads throughout the economy, the Japanese Government has also used preferential tax treatment, credit, and government supported leasing companies to encourage the diffusion of new technology.

Mr. Chairman, that concludes our statement. We would be happy to answer any questions.

Mr. **Gore**. Well, thank you very much for getting this panel off to a good start.

Our second witness on this panel is Dr. John Zysman from the University of California, Berkeley.

STATEMENT OF DR. JOHN ZYSMAN, UNIVERSITY OF CALIFORNIA, BERKELEY

Dr. **Zysman**. Thank you. I appreciate the opportunity to express my views to you.

I would like to first put forward an interpretation developed by the Berkeley Roundtable on the International Economy which deals with Japanese strategies of creating an advantage and illustrates that strategy. And second, to look at a couple of examples other than the semiconductor industry which we have looked at in some detail and which has been discussed quite thoroughly here today.

To begin my remarks let me say that joint R&D efforts in Japan don't serve one single purpose. A number of them have been mentioned here and I think it is worth underlining what those are. First of all, they serve to advance the state of the generic or basic technologies in Japan and in that process, at the same time to help, in many cases, specialize producers along certain types of product lines that has been evident in MITI laws and MITI directives in both machine tools and in semiconductors.

Second, as Mr. Mendelowitz emphasizes, these policies have also served to help diffuse the technologies not simply to other uses but in many cases the specific producers. That is you have a situation in which not all producers are equally advanced in a given technology and the joint programs, in many cases, serve to diffuse the technology among the producers in Japan which creates, in fact conditions for quite intense competition.

Third, it tends to create standards. For example, many software languages and other kinds of devices that create amongst the Japanese a commonality of effort which focuses the efforts of the several firms along a single line. And fourth, it does diffuse this technology very actively to the users. It tends to try and create markets for these new technologies.

Now, these efforts, really apart from the funding of comparable American efforts, how that should be done poses two kinds of problems in the United States. One is that we must now find ways of assuring that the flow of technology is not one-way from Japan to the United States. Japan is no longer simply a technologically imitative society. There are independent flows and developments of technology in Japan. We have to find mechanisms to assure that developments in Japan are available to American scientists, and American industrial developers.

Second, that the efforts at joint technology in Japan are often linked to development efforts, to the actual commercialization of those products. We can't talk about those two problems in isolation.

I have laid out a more elaborate interpretation of how the Japanese system works in my written remarks. Let me simply say that Japan really can be best defined as a system of controlled competition. It is a phrase that we developed and only to discover that several people including Professor Murakomi of the University of Tokyo had started to use the same language in describing the Japanese system in Japanese.

The Government in Japan really, if we take this, it is a web of policies, and no single one matters. If we take the web of policies they add up in a very clear way. The Government plays two roles. First of all, it has been in the past more so than today but even now it is a gatekeeper controlling external access to the domestic economy. In the 1950's and 1960's this permitted the Government to split up the package of technology, capital and management that multinational coporations represented. And second, it has been a domestic promoter, an active player in the market providing funds to encourage R&D, to allow financial expansion of firms that may have developed an appropriate product, and equally importantly actively encouraging the development of markets for new products through promotion efforts for the users and where necessary, actually structuring the terms of competition.

This issue of controlled competition points to two things. There are really two cartoon like images both of which are fundamentally incorrect in our view of the Japanese economy. One is a notion of Japan, Inc., that in some sense there is a centralized controlled body that organizes the way in which that economy operates.

Second that there is some kind of system of free competition that is the driving force here. In fact, what one has is real intense competition amongst the domestic groups for market share, a competition which is often induced by Government action and sustained by Government actions. At the same time, one has mechanisms for structuring and containing that competition.

Joint R&D ventures are certainly one of those. In the development of the steel industry, for example, a set of entry arrangements whereby firms were only allowed to enter steel production with efficient plants. Actual market share was essentially allocated. Efforts with new technologies to encourage product specialization, a whole variety of techniques to try and assure that competition, while very intense is also channeled. I think that is really the best word.

The way in which this from an American standpoint tends to fit together in the current period is that while many of the formal and most active mechanisms of intervention and market promotion have been loosened, this developmental system, a system aimed at creating industrial advantage has been loosened some, several critical elements still remain.

The first element that still remains is this indication in the form of research and development funds in many cases—the certification of appropriate direction, if you will—that then makes available funds both for development and for rapid market entry.

In much of the issue on capital availability in Japan really has focused on a cost of capital. In our view part of it is really the implicit guarantee of risk. You enter a new market. You are going to have funds available. It is not an issue of trying to find them. It is not just an issue or matter of whether the money will be there. The funds will be available and if, in fact, money is made available risk is, in a sense, bounded.

Now, of course that means that for all firms it is very attractive to very rapidly enter the market and get what market share that you can and then, if in fact you have too much production, two things happen. One, is that there are always foreign markets to which you can sell and second, if there is still excess demand there are a series of cartel laws for the arrangement and management of over-supply and excess capacity which means that the game, as long as it remains a purely domestic game can be structured and can be internally managed.

Now, it is within that context that Japanese firms operate. It is important to recognize that the advantages as the witnesses on the first panel have suggested that are created by this are not temporary. These subsidies do not, in a sense, create a distortion of the market which, if they were only removed would return us back to a point of stability which we could all then compete with. Rapid expansion of Japanese production, for example in autos from 160,000 to 10 million cars in a 20-year period generates fundamental innovations in, for example, production design and production operation which means that when subsidies are removed you actually have a real change in the competitive position of two national industries.

We must not just look at what is done now but at the way in which it reshapes the structure of these two economies.

Now, we have heard some earlier about the semiconductor industry. In the semiconductor industry an important part of that effort has been in the development of generic and basic technologies. In two other areas which I would like to mention very briefly in passing, one is the automated production equipment industry in which robotics fits, also new machinery controlled machine tools, computer-aided design and also the biotechnology area. One finds joint research and development programs playing a slightly different role. Most importantly in the automated production industries, Japanese research funds have encouraged two things. The development of applications and the diffusion of that technology.

In many cases the mechanisms for the diffusion of that technology are quite familiar when you look in detail at them. The Hudy machine tool manufacturers petition which gained some notoriety in this town a few months ago focused on the amount of money being poured into the machine tool industry by the Japanese Government. If you look in detail at the figures what one finds is that an important portion of that money is really being poured into technology centers in each state, if you will, and each of those centers is a mechanism not just for developing new technologies for producers but to assist the users to find ways of adopting these new technologies, to find ways of fitting them to their own needs and companies. We have a parallel here, we call it the Farm Extension Service. In fact, what we are looking at is a factory equivalent of the American Farm Extension Service by suggesting that there are Japanese approaches which fit into our own ideological heritage which could be quite appropriate. That issue of diffusion is critical because the distinction between sunrise and sunset industries is a fundamentally false distinction. Many of these so-called sunrise industries are ultimately producer goods industries. None of us use random access memory devices in our daily lives. We use them in some other product and if all of these other industries run into trouble, and they will unless they adopt new and innovative production technologies, there won't be anyone to sell the employees the advanced electronics products.

Now, in the biotechnology area one finds a slightly different pattern. Funds in that area, for the moment are small, narrow in scope, and have served the purpose of importantly fusing technologies amongst producers. In many cases the direct participants in the government sponsored programs are producers who are not at the cutting edge in Japan of the technology. This is a mechanism of their catching up and of, therefore, diffusing the technology widely in the Japanese case. At the same time, those funds suggest an interest in Japan in the application of these technologies and many of the programs are not focused at basic technology but are focused at starting to think through the question of how, as the technologies evolve they will be introduced into the chemical industry and the pharmaceutical industry, the agriculture industry. Again, it is a matter of focusing government efforts, as it were, at the bottleneck point in the evolution of these new technology industries. It is not just an unthought out effort of throwing money in a single direction.

Let me summarize how we should respond to Japanese technology areas.

The Japanese system is organized around an elite bureaucracy, a credit system very open to government influence in the allocation of credit and we can't, in any simple way, try and imitate the policies that the Japanese have. Our institutions are so fundamentally different that mimicking them in an unthought out kind of way is going to run us into real trouble.

Setting aside the specific issue of joint research ventures that was mentioned earlier, there are several issues I would like to emphasize. One is the importance of developing government programs to help diffuse these technologies. For example, the development of something we have called for, an American factory extension. Some kind of mechanism to start trying to diffuse technologies in different areas.

Second, trying to assure that R&D intensive companies which are medium sized, the entrepreneurial companies of which we have heard so much which are competing in international markets in production expertise with large-scale firms that have deep pockets, as it were, have funds to both do R&D and to compete on a production basis which is really the story of the Japanese mastery of the large-scale random access memory market.

Third, entry into the Japanese market and participation in that market and in those technologies are critical. Entry into the market on a basis to compete is obviously a trade issue. Mechanisms to try and help draw Japanese technologies back into this country to keep abreast of them and diffuse that knowledge in this country is an issue that would seem to me quite appropriate for a committee of this sort. Lastly, I would simply underline the critical importance that has been mentioned earlier of university funding. Rich universities do an excellent job at both teaching and at research. Universities such as the University of California which is strapped for funds finds it difficult to do both. It really is not a choice and without that we will end up with neither.

Thank you.

[The biographical sketch and prepared statement of Dr. Zysman follow:]

Brief Biographical Statement

JOHN ZYSMAN is director of the Berkeley Roundtable on the International Economy (BRIE) and an associate professor of political science, both at the University of California, Berkeley. He is a graduate of Harvard College and the Massachusetts Institute of Technology (Ph.D., 1973). He has served as a panel member on international competitiveness in biotechnology for the Office of Technology Assessment, and as a consultant to the Presidential Commission on a National Agenda for the 1980s (on international trade and industrial policies). Prof. Zysman's publications include: Governments, Markets, and Growth: Finance and the Politics of Industrial Change (Cornell University Press, 1983); "Double or Nothing: Open Trade and Competitive Industry," with Stephen Cohen, Foreign Affairs, Summer 1983; American Industry in International Competition, ed. with Laura Tyson (Cornell University Press, 1983); U.S.-Japanese Competition in the Semiconductor Industry, with M. Borrus and J. Millstein (Institute of International Studies, UC Berkeley, 1982); The Mercantilist Challenge to the Liberal International Trade Order, with Stephen Cohen, U.S. Congress, Joint Economic Committee, 1983; and Political Strategies for Industrial Order: State, Market and Industry in France (University of California Press, 1977) and published in French as L'Industrie Francaise entre l'Etat et le Marche (Bonnell, 1983).

Japanese Technology Development: The Issues for American Policy

John Zysman

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Japanese technological development has moved from an era of simply borrowing and applying technologies (such as steel production techniques) established elsewhere, through a phase of innovative development and application of state of the art technology (such as RAM chips), toward concerted efforts in a range of fields from electronics to biotechnology, to achieve a distinct advantage. Japanese industrial achievements pose a substantial pressure both on traditional American manufacturing sectors such as automobiles and on the more advanced high technology sectors. In my remarks here I will set forth the interpretation developed by our work at BRIE on Japanese strategies of creating advantage and illustrate that strategy with several case examples. Finally, I will emphasize that while Japan's development poses serious problems for the United States, our institutional structure precludes us from imitating their approaches. Responding to the Japanese challenge will require making our own system work more effectively.

Individual policies--such as joint research and development--are not themselves critical to the success of Japanese promotional policies. It is the web of policies and the purposes to which they are put. This must be clearly understood to develop appropriate American policy. For twenty years from the mid-1950s to the mid-1970s, Japan was a highly orchestrated developmental system. The government's primary commitment was to economic growth and the transformation of the economic base from agriculture to industry. To do this the government aggressively and actively established the infrastructure for private firms to expand, develop and compete. Infrastructure was very broadly defined and included sectors such as steel and shipbuilding critical to the entire economy. If not adequately developed such sectors would represent a bottleneck or a handicap.

The government assured critical sectors of the financial resources they needed to expand competitively, both providing budgeted funds and manipulating the financial system to do this. Similarly it assured the importation and domestic development of critical technologies. In this sense it targeted those sectors. However, that metaphor is misleading and understates the complex web of arrangements that underlay the competitive drive for success within Japan. The government played two roles. First, it was a gatekeeper controlling external access to the domestic economy; this permitted the government to split up the package of technology, capital and management that the multinational corporations represented. Second, it was a domestic promoter providing funds to encourage R&D, financial expansion, promoting the development of markets, and where necessary actually structuring the terms of competition. However, any metaphor such as Japan Inc. which implies direct central control is profoundly misleading. As important as government policies were, the direct engine behind growth was domestic competition.

The Japanese system is best described as one of controlled competition. There has been real and intense competition among domestic groups for market share. That competition was often described by MITI as excessive, although its own policies of support for those who entered favored sectors and of further support for the winners induced rapid entry and often over-expansion as firms sought to establish quickly defensible market share in critical sectors.

If the competition was real, it has also been structured, limited, and bounded. The mechanisms varied. Joint R&D projects served to develop and diffuse generic technologies. The development of those technologies is thus eliminated as an element of competition and their industrial application and manufacture become critical. When steel was a rapidly expanding sector in Japan, authorities were concerned that only the most efficient plants be built. Consequently, the entry of new plants to the market was regulated, each firm waiting in line to build plants to assure that growing demand did not generate a multitude of small scale and inefficient facilities. Something similar was at work in the urgings from MITI to machine tool producers to specialize in specific applications. Finally, government-established cartels limit the risks of overly rapid expansion and excessive competition by regulating oversupply when domestic demand drops or expansion is too rapid. This system of controlled competition--a phrase we developed in English only to discover it was also used by the Japanese themselves--does not have a universal set of unchanging rules, but rather the rules must be clarified sector by sector, and they change over time. The purpose of the system has been to create enduring advantage in the market.

We must develop new perspectives on trade to address our real policy choices. Production technologies and factor availabilities, unlike mountain ranges, are not immutable features of a nation's economic topography. There are only a few industrial sectors such as coal or oil in which comparative advantage is given in the form of fixed natural resource availability, and even here transportation facilities may alter a seemingly self-evident calculus. Japanese transportation policy gave its basic industries a cost advantage by importing raw materials. In most sectors--particularly the manufacturing sectors which dominate the production and trade of advanced industrial countries--comparative advantage is partly the product of national economic policies. Such policies influence the accumulation of physical capital, the pace of research and development, and the development of labor skills and education, all of which underlie the factor "endowments" and production technologies dear to classical theory. A concerted long-range policy effort can steadily turn a competitive disadvantage in capital, education, or research intensive industries into a national comparative advantage. In short, national comparative advantage can be created by national policy measures. From this perspective a nation that subsidizes its exports may transfer wealth to other countries in the short term, but it will build its own wealth in the long term if it promotes an enduring comparative advantage for domestic industries.

Japanese firms have achieved real and enduring advantages in the market as a result of the very rapid expansion of the economy. Those advantages are rooted in real corporate strategies for the market and tactics for production organization. Japanese culture may have facilitated these market innovations, but the driving force was marketplace incentives. Let me explain. Japanese automobile production jumped from 160,000 cars in 1960 to some 10,000,000 at the end of the 1970s. Each new assembly line was an experiment station for production, and the Japanese companies could innovate and come down that infamous production learning curve. Japanese production expertise in semiconductors depends as much on the possibility of very rapid expansion and introduction of advanced production equipment in a stable domestic market as on any cultural characteristics or special management secrets.

The Japanese system has evolved in recent years. As companies have become richer, closer to state of the art technology, and established in international markets, the influence of the government under routine market conditions has waned. Under pressure from trade partners abroad, most formal restrictions on entry to the Japanese market have been lifted. Nonetheless, the pattern of Japanese trade in manufactures with the rest of the world is different than that of any of the other advanced countries. Japan relative to the others tends not to import manufactures in sectors in which it exports, an intense pattern of import substitution. Substantial barriers to entry remain both in private and public practice. The developmental system of created advantage is still applied in advanced sectors considered to be of national importance. Most importantly, the combination of promotional policies and administrative guidance in expanding markets still generates the rapid expansion and intense competition described earlier. Easily available funds for production expansion encourages firms to rapidly move down each learning curve! With excess capacities, cartels and negotiated arrangements protecting against the consequences of too rapid buildup, the tendencies to expand capacity rapidly in the hopes of gaining national and international market share are reinforced. The result is the pattern of aggressive export drives we are now familiar with. Any single case or policy must be considered against this background.

Let us consider how this system works in technology areas, automated production and biotechnology. We have already heard about the semiconductor industry, where the VLSI preogram helped Japanese firms catch up to state of the art technology and manufacturing expertise permitted them to enter the world market for standard memory devices. Automated production technology --numerically controlled (NC) machine tools, robots, and computer-aided design (CAD) systems--is the industry through which the microelectronics industry is directly impacting the organization of work in all industries.

Both Japan and the United States have had important policies for promotion in this sector. The Japanese policies have been oriented toward civilian markets and the application to a wide range of firms. American policies have been oriented toward use in military products and have had their biggest impact in the automobile and aircraft industries. The results in the market are clear. Let us look more closely at NC machine tools. Until 1976 Japan imported these machine tools, and only since 1976 have they become exporters. Yet since then they have almost elminated imports and captured nearly half of the United States market. These are important differences in the arrangements of the market. An NC machine tool consists of a cutting device and a computer that controls it. In Japan, one major producer of controllers has emerged, while in the United States there is a competition among producers of machine tools based in part on differences in their controllers. The Japanese now compete in the application of these controllers to machine tools, permitting the one company--Fujitsu Fanuc, with close ties to computer and semiconductor manufacturers--to innovate in the controller technology. The competition has been structured. In both robotics and machine tools, though, the most powerful government policies have been to encourage use of these sophisticated machines throughout the economy and in particular in small and medium-sized companies. Indeed, with funds drawn from the bicycle racing tax, the Japanese have established in each prefecture applications development centers which can serve to diffuse these technologies. A market has been created. As I noted, American policy also created a market--for military-related uses. Those policies often diverted producers from civilian applications, in some cases making civilian applications of overly-sophisticated programming languages difficult. The marketplace outcomes reflect the priorities of the two government programs, particularly in NC machine tools. The up-end of the market is still dominated by American producers, while the simpler end of the market is captured by Japanese producers who have developed a large variety of machines for a variety of particular market segments. Of course, in a wide range of sectors, the Japanese have entered the market in simple or standard devices and established a strong position from that base throughout the market. The great risk here is that the rapid spread of such technologies in Japan while the U.S. moves more slowly, will help the Japanese to establish competitive advantage in a wide range of industries that use these products to make their own final goods for consumer or producer markets.

Biotechnology is still another sector in which Japanese competitive potential has raised concern. The new biotechnology symbolized by gene manipulation is a series of techniques and processes which will affect a wide range of industries from pharmaceuticals and agriculture to chemicals. It is not in itself an industry producing a product sold either to final consumers or to other producers. The range of firms we now see as biotechnology firms--Cetus, Genentech, in my part of the world--are really research labs with a technique trying to enter a series of industrial markets. The U.S. system of venture capital developed in these firms a powerful instrument of technology development. Japanese policy has certainly chosen to promote the development in Japan of the generic techniques underlying this new world of biological manipulation. Equally important, however, the Japanese strength in the industry is in the techniques of fermentation required for effective production. Our problem competitively will be to assure both effective commercial application and a strong production position.

To conclude, the Japanese system is organized around a centralized and elite bureaucracy, a credit-based financial system open to government influence in allocation of credit, and a position of economic backwardness relative to other industrial nations that created aggressive market tactics. U.S. policy will not succeed by attempting to imitate directly a system that is dramatically different than our own. We cannot and would not want to transform our system into theirs, and we wouldn't run that system as well as they do. We must make our own system work more effectively. We must focus not only on what we must build in the way of marketplace techniques to encourage competitive response. Joint R&D efforts are certainly to be encouraged, where the efforts focus on generic technologies that underlie competitive products. Programs to diffuse automated production technology to help encourage innovation in production and worker productivity are to be encouraged. Financing techniques to permit firms to compete in production with integrated Japanese firms will be needed. There will be no panaceas.

Mr. **Gore**. Thank you. I found that very interesting. We appreciate it. We will hold questions.

Our final witness on this panel is Mr. Joji Arai of the Japan Productivity Center.

We welcome you back to our subcommittee. You were most helpful during our hearings on robotics. We appreciate that and appreciate your presence here today.

Welcome and please proceed.

STATEMENT OF JOJI ARAI, DIRECTOR, JAPAN PRODUCTIVITY CENTER

Mr. **Arai**. Thank you very much, Mr. Chairman, and thank you again for affording me an opportunity to express the view of the Japanese on the Japanese issues.

The competitiveness of products and services a nation or a company offer in both the domestic and global market depends pretty much upon quality productivity and pricing policies.

Japanese, both in the public and private sectors, recognized the strong need for improvement in these areas and strove to attain the goal of economic growth through collaboration and cooperation among government, business and labor. The nation, without natural resources, aggregate wealth and military power, opted to develop comprehensive and flexible industrial policies and the national productivity movement in order to maximize the use of expensive raw materials and energy imported for survival of the country.

Since Japanese could only consume the value added by processing imported raw materials and energies, obviously the past practice of producing a large amount of inexpensive sundry goods, which were fit only for less sophisticated markets in the developing countries and the lower end of markets of advanced countries, had to be abandoned.

This thinking resulted in the Government policy of promoting the rapid growth of heavy and chemical industries in the 1950's, and a transition of priority to the industries' products with higher technological content such as ships, automobiles, electrical and electronic equipment in the 1960's. This was done through administrative guidance, tax benefits and low-interest loans in the early stage of their development. The direct interference by the Government, however, was usually limited to the initial stage of industrial development, and competition was encouraged in the open market after the development of generic technology by the joint efforts of the public and private sectors.

Coincidentally, the development of this type of policy took place when Japanese were exposed to the liberal American labor movement and German rationalization movement. The exposure triggered the emergence of moderate labor leaders who replaced the old timers in the movement who were pursuing the goal of establishing a proletarian society through class struggle. The new leaders advocated the need to collaborate with management in expanding the size of the pie without a fierce confrontation over the percentage share to which they were entitled. Management was ready to respond as they were aware of their weak position in equity with a net worth of around 15 percent, considerably smaller than American and European companies in similar product lines.

The emerging rapport between business and labor prompted many Japanese companies to establish a new philosophy with respect to corporate goals:

A company serves people who work for it.

A company serves people who buy their products and services.

To accompish goal No. 1, companies were to offer lifetime employment to their people which required development of long-term strategic plans and investment programs because they cannot lay off or discharge employees in order to retain profit in time of a declining economy. The inability to make adjustment in the denominator of productivity, that is, labor input, also forced them to develop a policy of investing heavily in people and equipment so as to maximize return on their investment. The labor equipment ratio is usually more than 10 percent higher for Japanese companies as compared to American and European companies. Investment in new plants and equipment as shown in the percentage of GNP has been twice as large as that of the United States in the past two decades.

Inflexibility of the denominator has forced companies to diversify downstream, forward, so that they may not be too dependent on limited product lines which might suffer equally in a declining economy. Transfer of workers and managers from job to job in different disciplines and locations became an accepted way of corporate life. Multiple skill, on-the-job training and education became a daily routine. The people orientation of management's attitude and their efforts to maximize the return on investment in people gave rise to paternalistic programs, the consensus based decisionmaking process, worker participation through quality circles, and labor management councils. Two million workers participate in QC circles and 14 million in labor management council programs which has reduced the number of days lost to strikes to 500,000 man-days as compared to 25 million man-days in the United States in 1981.

Corporate goal No. 2 required companies never to place defective products on the market or give unsatisfactory service. Total quality control, otherwise known as corporatewide quality control program, required the commitment of chief executive officers as well as lower ranking men on the shop floor. Rather than inspection-oriented quality control, Japanese opted to develop new product designing and process oriented quality control systems so that the first-time products come off the line they are without defects. In the process, Japanese discovered that a serious commitment to quality improvement actually resulted in a reduction of costs and an expansion of the market share. This is contrary to the traditional concept held by many old time American managers that quality investment diverts capital necessary for production.

The accelerated investment in quality improvement and subsequent, successful penetration of foreign markets taught Japanese management the importance of applying the experience curve in further reduction of the cost of the products and increase in market shares. Their investment in forward diversification also helped to strengthen their position for they were less affected by drastic fluctuation of prices in the merchants market than highly specialized American and European manufacturers.

As for technological innovation which has long been recognized as the primary contributor toward productivity enhancement, as of 1980, Japanese invested 2.42 percent of national income in research and development projects as compared to 2.61 percent of the United States. The number of researchers per 10,000 population is 27 as compared to the United States 29. Essentially, Japan's R&D effort is private-sector oriented in that, of the total expenditures, Government funding represents only 26 percent as compared to 48 percent in the United States. Contrary to the general perception of the American public that the Japanese Government subsidizes a substantial portion of the joint R&D efforts by Government and private sector as a part of its industrial policy, actually the United States subsidizes a higher percentage of the private sector R&D projects even excluding military R&D.

Japanese policy in the past was to purchase technologies from advanced countries and then develop new products based upon the acquired technology. Even now, that is as of 1981, Japan buys about $1.6 billion of technology while she sells only $500 million, creating a $1.1 billion deficit in technology trade. However, a high percentage of royalty payments were based upon long-term licensing agreements. When one reviews new contracts only, Japan became a technology export country in 1972. One hundred ninety-one thousand patents were submitted in Japan, far exceeding the 169,000 of the U.S.S.R. and the 104,000 of the United States in 1980.

These facts are indicative of Japan's acute awareness that she needs to develop her own technology to maintain her economy as she continues to depend upon an outside supply of raw materials, energy, and food. Her efforts will continue to create higher value to be added for it will only come with the transition from traditional industry to a knowledge-intensive one.

There are many other paradoxical issues facing Japan. She knows, however, her future lies in rapport with other countries, particularly the United States.

In closing, I might mention that the fifth-generation computer project which is the intention of Americans actually has been interpreted the wrong way by many Americans. I would like to mention the fact that the American companies are invited to participate in that program and have not been set as a target in the fifth-generation computer project except in a 10-year period that they want to accomplish the system which will overcome the weaknesses of the contemporary computer such as many contemporary graph patterns and speeches. What Japan is trying to do is develop a system which can come up with the capability to develop inference, association, and learning and that the Japanese are willing to share their experience and technology with outside companies.

Thank you.

[The prepared statement of Mr. Arai follows:]

PREPARED STATEMENT OF JOLI ARAI, DIRECTOR, JAPAN PRODUCTIVITY CENTER

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This thinking resulted in the government policy of promoting the rapid growth of heavy and chemical industries in the 1950's, and a transition of priority to industries' products with higher technological content such as ships, automobiles, electrical and electronic equipment in the 1960's. This was done through administrative guidance, tax benefits and low interest loans in the early stage of their development. The direct interference by the government, however, was usually limited to the initial stage of industrial development, and competition was encouraged in the open market after the development of generic technology by the joint efforts of the public and private sectors.

Coincidentally the development of this type of policy took place when Japanese were exposed to the liberal American labor movement and German rationalization movement. The exposure triggered the emergence of moderate labor leaders who replaced the old timers in the movement who were pursuing the goal of establishing a proletarian society through class struggle. The new leaders advocated the need to collaborate with management in expanding the size of the pie without a fierce confrontation over the percentage share to which they were entitled. Management was ready to respond as they were aware of their weak position in equity with a net worth of around 15%, considerably smaller than American and European companies in similar product lines.

The emerging rapport between business and labor prompted many Japanese companies to establish a new philosophy with respect to corporate goals.

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To accomplish goal number one, companies were to offer lifetime employment to their people which required development of long term strategic plans and investment programs because they cannot lay off or discharge employees in order to retain profit in time of a declining economy. The inability to make adjustment in the denominator of productivity, i.e., labor input also forced them to develop a policy of investing heavily in people and equipment so as to maximize return on their investment. The labor equipment is usually more than 10% higher for Japanese companies as compared to American and European companies. Investment in new plants and equipment as shown in the percentage of GNP has been twice as large as that of the United States in the past two decades.

Inflexibility of the denominator has forced companies to diversify downstream (forward) so that they may not be too dependent on limited product lines which might suffer equally in a declining economy. Transfer of workers and managers from job to job in different disciplines and locations became an accepted way of corporate life. Multiple skill, on-the-job training and education became a daily routine. The people orientation of management's attitude and their efforts to maximize the return on investment in people gave rise to paternalistic programs, the consensus based decision making process, worker participation through quality circles, and labor management councils. Two million workers participate in QC circles and fourteen million in labor management council programs which has reduced the number of days lost to strikes to 500,000 man days as compared to 25 million man days in the United States.

Corporate goal number two required companies never to place defective products on the market or give unsatisfactory service. Total quality control (otherwise known as corporate wide quality control program) required the commitment of chief executive officers ~~and~~ as well as lowest ranking men on the shop floor. Rather than inspection oriented quality control, Japanese opted to develop new product designing and process oriented quality control systems so that the first time products come off the line they are without defects. In the process, Japanese discovered that a serious commitment to quality improvement actually resulted in a reduction of costs and an expansion of the market share. This is contrary to the traditional concept held by many old time American managers that quality investment diverts capital necessary for production.

The accelerated investment in quality improvement and subsequent, successful penetration of foreign markets taught Japanese management the importance of applying the experience curve in further reduction of the cost of the products and increase in market shares. Their investment in forward diversification also helped to strengthen their position for they were less affected by drastic fluctuation of prices in the merchants market than highly specialized American and European manufacturers.

As for technological innovation which has long been recognized as the primary contributor toward productivity enhancement, as of 1980 Japanese invested 2.42% of national income in research and development projects as compared to 2.61% of the United States. The number of researchers per ten thousand population is 27 as compared to the United States' 29. Essentially, Japan's R&D effort is private-sector oriented in that of the total expenditures, government funding represents only 26% as compared to 58% in the United States. Contrary to the general perception of the American public that the Japanese government subsidizes a substantial portion of the joint R&D efforts by government and private sector as a part of its industrial policy, actually the United States subdizes a higher percentage of the private sector R&D projects (excluding military R&D) and, in aggregate, a sum twice more than Japan.

Japanese policy in the past was to purchase technologies from advanced countries and then develop new products based upon the acquired technology. Even now (as of 1981) Japan buys about 1.6 billion dollars of technology while she sells only 500 million, creating a 1.1 billion deficit in technology trade. However, a high percentage of royalty payments were based upon long term licensing agreements. However, when one reviews new contracts only, Japan became a technology export country in 1972. One hundred ninety one thousand patents were submitted in Japan far exceeding the 169,000 of the U.S.S.R. and the 104,000 of the United States in 1980.

These facts are indicative of Japan's acute awareness that she needs to develop her own technology to maintain her economy as she continues to depend upon an outside supply of raw materials, energy and food. Her efforts will continue to create higher value to be added for it will only come with the transition from traditional industry to a knowledge intensive one.

Japan's path for the future will not be an easy one for she faces challenges from many quarters.

Let us look at a few.

1. A relative rise in productivity in certain product lines, economic sectors and pricing strategies tend to upset a needed balance in international trade and result in serious displacement problems giving rise to protectionism.
2. The slow growth era which followed a series of oil crises afflicted many advanced countries with shrinking demands for goods and services, high unemployment, excessive welfare payments, increasing national debts, high interest rates, retarded investment in new plants and equipment, a slow down in technological innovation, and an emergence of conversion rates not reflecting economic fundamentals.

3. The shrinking market and structural weakness are excessively depressing the raw material processing industries, such as aluminum, caustic soda and petrochemicals.

4. Through their own experiences or analyses of Japanese systems, many American companies are streamlining their organizations, shedding fat and flattening their pyramid structure. Many have introduced participatory programs such as Quality of Work Life Programs, Quality Circles and other motivational programs to improve the quality of the labor force, as well as the quality of their products.

5. Many Pacific Rim countries with high growth potentials are heavily investing in new plants and equipment and applying Japanese type motivational programs. With relatively low wage levels and accelerated growth in productivity, such as Japan had twenty years ago, these countries are becoming highly competitive in the Japanese and international markets.

6. The shrinking market for traditional goods and services retarded the Japanese investment rate resulting in a decline of capital stock less than five years old from 60% to 45%, while that of the United States remained at the constant level of 35%.

7. The Japanese onslaught to automate manufacturing operations with an increasing number of robots will accelerate a transition of the labor force from the

manufacturing to the tertiary sector. The tertiary sector of Japan has the productivity level of 65% of that of the United States. The high performance of the manufacturing sector will be off-set by the inferior tertiary sector.

8. Women in the labor force have played a secondary role in the Japanese economy. As more women enroll in institutions of higher education, these women will demand equal opportunities to pursue professional careers. If companies were to extend lifetime employment to them as to their male counterparts, it will overburden the already over extended financial capability of companies.

9. Although Japan became a technology export country as far as new accounts are concerned since 1972, a majority of the recipients of Japanese technology are developing countries. More than 80% of the technology that the United States exports is destined to advanced countries. This is indicative of the degree of sophistication of Japanese technology.

10. Japanese usually score high on tests in such disciplines as physics, mathematics and chemistry. However, the Japanese school system places heavy emphasis on memory functions and is not conducive to creating a large number of innovative people.

11. The high degree of automation both in plants and offices and the advance in communication systems may deprive Japanese a traditional work place where face-

to-face contact generates the basic concept of rapport.

12. High potential growth areas identified by Japanese for future technological progress, such as micro-electronics, computers, laser applications, optical fiber, communication equipment, recombinant DNA, nuclear fusion and others are also the focal point of attention of Americans.

13. While 6,8 billion venture capital financing is available for high tech new business in the United States, which makes a substantial contribution to technological breakthrough, only a fraction of that amount is available for the Japanese counterparts from similar Japanese sources.

There are many other paradoxical issues facing Japan. She knows, however, her future lies in rapport with other countries, particularly the United States.

Mr. **Gore** Thank you very much. A very, very interesting and informative statement.

Congressman Walgren.

Mr. **Walgren** Mr. Arai, on the fifth-generation computer again this is an invitation for U.S. firms to participate in the basic research in that project?

Mr. **Arai**. Yes, sir. As a matter of fact, when this idea was developed by Japanese Government and the private sector representatives, I believe four or five American experts as well as one each from England, Germany, and Israel were invited to participate in a formulation of the original concept. Most of those expressed a doubt as to whether or not the Japanese would be capable of perfecting the system.

Subsequently, when the idea developed into the project I believe two American companies were invited to participate in the program. I believe that one of the companies had already accepted the offer of the Japanese and indicated to the Japanese that they were sent as experts to participate in the program.

Mr. **Walgren**. On a related matter, the emphasis on trying to assure that technology may flow from developments in Japan to participants in the U.S. scientific community can you give us any assessment of our U.S. efforts to access that developing science? It has been raised with us that our review of the scientific literature is relatively limited in this country that we apparently do not make the effort to comprehensively review internal Japanese publications. And second, that our language skills really are not there yet to enable us to adequately review Japanese developments. Can you comment on that?

Mr. **Arai**. Yes, sir. The review of technical publications in a 1-year period will indicate to you that the largest percentage of those technical articles come from the United States.

Next you observe the fact that Germany, France, and a few other European countries have the next highest percentage of technical papers and I believe the Japanese papers represent approximately 4 or 5 percent. That, I believe, is primarily due to the language difficulty. You have to recognize the fact that highly technical Japanese papers are written in Japanese and not many foreign scientists have ready access to those papers even though many Japanese scientists try to write their papers in English.

As for the accessibility of the fruits of joint effort of many Japanese companies and the Government in development of generic technology, I believe recently the Nippon Telegraph & Telephone opened up to American, as well as other foreign and domestic competitors, to bid in the research and development project. I believe Director General Shen Dug made that statement public and that the Americans are invited to participate in many of their programs.

In the same way I believe that the Japanese Government officials are negotiating with their American counterparts to come up with joint research and development projects.

Mr. **Zysman**. Mr. Chairman, may I comment on that?

Mr. **Walgren**. Dr. Zysman.

Dr. **Zysman**. I certainly think that all Chinese efforts in this direction should be encouraged. Let me emphasize two elements I think we must pay attention to while doing that. First of all, since much of Japanese effort is in applied technology, and in technology rather than in basic science it is much harder in this country inherently to follow the character of development. That is much of it is in the character of technology and not specifically in the character of published scientific papers. A number of larger American companies have now established, to my knowledge, in-house, in Japan, substantial efforts to try and do that. The problem, of course, is that it is not generally available to the rest of the national economy and I think certainly something to be considered is not just the diffusion of scientific knowledge but an effort to monitor, as it were, the ongoing evolution of Japanese technology. On the issue of participating with the Japanese in research and development programs, there are two other things that need to be considered. At least the one major American company decided not to join the fifth generation computer program because it felt it was substantially ahead of the Japanese in that area. Now, the question is what does that imply. Japanese programs are, in fact, research and development programs. NTT's suggestion that Americans bid on the first track, as it were, of NTT procurement processes has to be tied up with open availability, and open and accepted bidding, and the winning of bids by American companies in the other tracks. Otherwise what America is doing by participating in those joint ventures is essentially once again transferring the technology which will be developed by, for example, NTT purchasers internally inside of Japan. At least, the one Japanese company emphasized to me that whatever was said or done that when it came to the purchases of cutting edge technologies, the most advanced technologies in which Japanese were potentially producers, it would be a sustained bias in favor of Japanese purchases.

The problem is not just a research program. We do that. We just have to understand what the character of participation in the research program is. More than simple participation is required. The restructuring of a number of the ground rules would have to accompany that.

Mr. **Walgren**. Thank you, Mr. Chairman.

Mr. **Gore**. Mr. MacKay.

Excuse me, let me withhold. We need to alternate.

Mrs. Schneider.

Mrs. **Schneider**. Thank you.

I would like to focus on the diffusion of technological research. I think that is an area where I am particularly frustrated sitting on the Technology Committee. We see that the technology is here for handling hazardous waste, but we are finding all across the country that many communities are grappling with the problems of how to deal with it.

How would you gentlemen, and any one of you may begin, recommend that we begin a really concerted effort to focus on the diffusion of the technology that we have available at this time?

Mr. **Mendelowitz**. I think that one thing we should keep in mind is that Japan is a unique society and a unique economy, and the United States is a unique society and a unique economy, and we each have our own ways of doing things. I would caveat any comment that applies to this with the warning that replication of individual aspects of what the Japanese do probably would not be necessarily productive.

Mrs. **Schneider**. Let me say that I am not looking necessarily toward the Japanese model of diffusion. I have read theory, and I am familiar with the differences of our culture. I am familiar with the general dynamics of it all. But if we are only talking about American technology, how can we do a better job using even a model that you may have in your own mind that may be fashioned after the Japanese, or some other model, or none that is in existence?

Mr. **Mendelowitz**. I guess I would have to comment on a personal level because we have not covered this in the report. But if you look at what the Japanese do and you look at what is available in the United States the difference is not in the availability or use of instruments or ways in which the Government intervenes in the private sector.

The Federal Government here does fund substantial amounts of research. The Federal Government provides loan guarantees, special credits, and special tax incentives for a whole range of different activities.

What distinguishes what is done in Japan from what is done here is that the availability of these government incentives and government benefits are much more narrowly focused so that you get a much more direct benefit in terms of the particular objective.

I think that what may be needed here is something akin to good strategic planning and that is identifying the problem, coming out with an objective and then using the instruments that we do have available to encourage the end result. And I think that that would be my recommendation that we go at it in a good strategic planning way.

Mrs. **Schneider**. More focus?

Dr. Zysman.

Dr. **Zysman**. I think, first of all, that the question of diffusion has to be focussed a bit. The question is to diffuse what? I think that several areas of the diffusion process are really quite critical.

One is the diffusion of manufacturing technologies in particular because it is in the broad range of manufacturing, both in standard products with standard technologies and often low-cost labor and complex manufacturing of products such as automobiles and televisions, where we run into serious problems and where Japanese willingness in many cases to automate earlier and more intelligently in that production process has been critical to the competitive position of American companies.

In that area, I think something, and I come back to this sort of idea that I used that I would emphasize a factory extension service which was aimed at trying to rapidly diffuse an understanding of what was available in new manufacturing technology, how they could be used. How they could affect small- and medium-sized producers as well as large producers. Large companies don't need so much help in following those kinds of developments. Many of the medium- and small-sized companies do. If you look at the outcomes and competition in numerically controlled machine tools for example, between the United States and Japan, one finds very interestingly that both companies have an important diffusion of program.

The U.S. program emerged out of the Defense Department. It was aimed at very large-scale complicated applications. That is the part of the market that we tend to dominate. The Japanese programs emerged out of civilian interest in the diffusion of manufacturing technology across the civilian sectors particularly in medium- and small-sized firms and that is the portion of the market that they have tended to dominate.

And I think we cannot simply depend on the Defense Department programs to be the vehicle of diffusion, not simply whether they work or not but whether they work in particular kinds of ways, not unexpectedly they focused on aeronautics and they have particular kinds of impacts. We need civilian programs, if we want to have civilian consequences.

Mrs. **Schneider**. Thank you.

Mr. Arai, did you want to comment?

Mr. **Arai**. Well, I certainly would not want to be presumptuous enough to make any comments with respect to the future developments of the United States on industrial policies with emphasis on research and development. However, as an observer of the U.S. situation being here a long time, I notice that while you have the technological breakthrough coming from the defense-oriented and space-oriented projects, that it takes a considerable period of time for the manufacturers to develop products from the technological breakthrough obtained through the funding by the Government.

For instance, the carbon fiber technology was developed by the United States with funding from the Defense Department. Right now it turns out that Japan produces just as much carbon fiber as Americans but the U.S. carbon fiber, a major portion of the carbon fiber produced in the United States is used for military purposes. The Japanese use carbon fiber for producing sporting goods which makes the Japanese manufacturers highly competitive because they have to compete in the commercial market, while the United States manufacturers tend to have monopolized market, the Defense Department. And that sort of trend prevailed in the diffusion of technology. The product cycle we find in Japan is usually shorter as compared to the cycle of the same product in the United States.

Curiously enough, even though the uncommon level of Japanese is still relatively lower than the American counterpart, that the Japanese public is a highly curious one, and that they always go for the new product. If you go to the stores in Tokyo you will discover that little stores sell many electronic gadgets boosting the consumption of those new products being developed by Japanese manufacturers utilizing new technologies. Again, I think it is the attitude of the public toward new products as well as the policy of the government in spending or allocating money.

Generally, I think there is an inference on the part of America and many Americans that the Japanese spend very little money on basic research. You will be surprised to find that percentage-wise of the total research and development funds that the United States spends less percentage on basic R&D. That more money is spent on applied research, as well as product development.

Mrs. **Schneider**. Thank you. That was very insightful.

Mr. Mendelowitz?

Mr. **Mendelowitz**. I would like to add one other concern in this matter. That is any time the Government gets involved in trying to encourage an activity in the private sector you run the risk of having Government funds replace private sector funds so that there is no net increase or no net benefit in terms of what you are trying to achieve. So that in any kind of effort to encourage activity of the private sector very careful thought should be given to designing what the Government does so that it genuinely encourages new effort and new funds in the private sector, so that we don't dissipate the Government effort by just replacing some private sector funds that are already there.

Mrs. **Schneider**. Well, picking up on that comment, I would like to move away from the R&D aspects into the actual application or utilization of new technology. And for my colleagues, I had an interesting personal experience. In New England we had some of the highest energy costs in the Nation and in my State, in particular. And, it was appalling to me to see that many of the manufacturing firms were on the verge of dissolving, primarily because of their energy being one of the major factors. And sitting on the Science and Technology Committee, I took with me to Rhode Island several experts who were able to tell these manufacturers about the technologies available for waste heat recycling for different manufacturing procedures that could accomplish the same end. So now, as a result, we have some of these companies using hydropower, once again, that they had used years and years ago in other technologies. And, we hope to work out the financing, too. But the problem that I really see, and that I still don't feel satisfied despite the very insightful testimony that I have heard from you gentlemen this morning, I still don't feel satisfied that we have provided that information link and that is the answer that I am looking for. I mean, every Member of Congress can't do a dog and pony show back in their district and say: "Here is the technology that will make your business thrive."

Somehow or other the private sector does not seem to be carrying that ball very well and certainly the government is not either. And so no one is doing the job. As a result we could be in a position where we would be mitigating major economic losses. But as a result, we are not.

Dr. **Zysman**. I think we should simply recall that that is what the Farm Extension Service does and that is its critical function.

Mrs. **Schneider**. Thank you.

Mr. **Gore**. Let me just comment briefly by saying in tomorrow's hearing Dr. Jordan Baruch who is a former Assistant Secretary for Productivity, Technology and Innovation at the Commerce Department is going to be testifying in some detail about measures to accomplish this goal and provide that information link.

I, myself, have been working with staff to develop an American factory extension service bill. There is legislation that has already been presented to the Congress known as the Stevenson-Wydler bill to establish regional centers for the dissemination of information of value and enhancing productivity which will also be discussed during tomorrow's hearing.

But I would agree with my colleagues who focused on that particular area because it seems to be a critical one.

Mr. MacKay.

Mr. **MacKay**. I have a question of Dr. Zysman and Mr. Mendelowitz. I head Mr. Arai say that Japan is spending far less in subsidies on R&D and was getting more results than we are because of a process in which the Government participates in planning and goal setting strategies and narrows the focus as compared to ours where we set up a tax credit which is available to anyone. And I tried to ask that question of the last panel. Are we not now at a point where we don't have enough money to continue just saying whatever you want to do we will put up half with a tax credit or maybe more than half and whether the relationship should not change. I use the term joint venture to imply that we don't want to dictate, that it would be a participative process and I was surprised at the answers. Maybe I did not make myself clear. I was surprised at the answers because the answers seem to say that we don't want any positive participation but we want an expansion. We want more money to keep doing what is not working as well as what is happening in Japan and we don't want any advice and we don't think it is appropriate for you guys to say what is in it for us.

Now, what I would like to ask you is do you see a more positive or a developing role for government in trying to focus this or is it inherent in America's pluralistic society that we have got to keep on saying whatever you want to do including whatever your CPA can imaginatively clasify as R&D we will be glad to put up half and we realize it is better because it is the way we have always done it.

Dr. **Zysman**. I would like to respond to that. There are several issues really implicit. One is that obviously part of the American R&D expenditure is military in character and therefore we would have to take that out.

Second, in earlier years up through the mid-1970's much of Japan's ability to focus its efforts was that it was a relatively backward economic system that had maps of its own future drawn from looking at our experience. Therefore, it knew that it needed in the 1950's a steel industry. It knew in the 1970's that it needed a semiconductor industry which allowed it to follow the signals of our marketplace in making those choices.

Mr. **MacKay**. Is that not a circumstances which has now changed? Do we not now have the cycle completed and we can look at them and see what we ought to be doing?

Dr. **Zysman**. I think we all face the problem of creating the future with less information, as it were. But I would emphasize that there are areas and it does not take a genius to figure out that the electronics industry is transforming a wide range of industry processes. The questions focus these issues in what way, between firms, between products, between sectors. I think one wants to focus efforts on what one might call future industries rather than trying to select between specifically different products. I am also quite familiar with the French system. Whenever you start trying to fiddle around with making very specific product choices it goes quite seriously awry. My own instinct would be that we want to start separating out those firms which make large expenditures in R&D from the rest of the firms in the economy. Even for something like investment tax credits. That is if you are spending more than a certain amount on R&D as a percentage of revenues then, in fact, it is assumed that you are facing constraints in production and in financing production as well. And we want to try and draw lessons from the specific industries which have problems to try to find generic solutions that, address this problem while reducing the management choices for government as much as possible.

I think wherever possible the general solution is probably better than the specific one simply because it is very hard to know what the appropriate developments to fund are even in an industry like the semiconductor industry there are very fundamentally different market bets being made by different companies. Part of our strength is that. We want to I think support the process of making those bets in specific areas such as electronics that we consider important rather than, let's say movie making because the taxes certainly support those kinds of investments as well.

Mr. MacKay. It supports a number of bizarre things.

Dr. Zysman. Absolutely. We might do best by eliminating some of the bizarre focus of our efforts.

Mr. Mendelowitz. My understanding is that national statistics on research and development capture a wide range of activities from basic research on semiconductor technology up to and including funds spent by the major automobile companies on restyling your vehicles so that that seems to me to indicate that anything that applies to research, research and development across-the-board would not be especially productive or contribute that much to society.

Second, I think everything else equal, most people prefer more than less, especially if they can get it for free. And tax expenditures are just as much a commitment of public resources as appropriated funds. I personally don't believe that it is appropriate for the public sector to divert resources to the private sector without any kind of oversight or concerns or conditions applied to the expenditure of public resources. So, therefore, I find myself supporting a very careful tailoring of any kind of public initiative in this area.

Mr. MacKay. Would we not be better off if we used an approach of saying you guys do it and whatever you do it must be better than us because you are in the private sector. Would it not be better for us to do that with perhaps a credit for retraining? In other words, are we not more in danger of falling behind because our education system is not upgraded to today's realities than we are because our technology is not?

Mr. Mendelowitz. Mr. Congressman, the question goes well beyond research in our report and so I really have to answer that on a personal level. My understanding is that based on a whole range of variables, performance on standardized tests, college entrance exams, a level of people being trained in technical skills, sciences, et cetera, that you have fingered a very genuine problem. If I can add really a very personal note, when I went to college, part of the funding support came from an NDEA loan which I am happy to say I have repaid in full. When I went to graduate school, I had the benefit of a National Defense Education Act fellowship. The project that I worked on as part of my doctoral research that led to my dissertation was supported by an NSF grant. I went to school throughout the decade of the 1960's when Government support for education was at its zenith and the production of scientists in this country was at some sort of peak. So, on a personal level, I definitely agree.

Dr. ZYSMAN. I think the first thing we have to realize is that there are no panaceas to this problem. No single policy is going to solve the problem. The program that I direct has involved looking at international competition in a dozen sectors or so. Particularly high technology sectors. In sector after sector the critical problem is often very different. It is clear that without a long-run solution to education problems we won't have to worry about detailed firm level competition. Let me simply underline this notion that the private sector in some sense is better situated to select than Government. The question is to select what I think the Government ought to emphasize the channeling of funds into the expanding high technology sectors. That is where growth has come and that is where jobs have been created over the last few years. I think those are the kind of choices that are quite appropriate. The detailed product choices and market choices are ones that even in a centralized corporation that the CEO or the central staff is not very often effectively in a position to make. They are general and not specific. So, if we separate even if a corporate logic of what the appropriate functions of Government are I think we can avoid the somewhat difficult ideological debate over what is public and private. Part of the Japanese strength is that they have avoided that argument and they have made very concrete and pragmatic choices.

Mr. MACKAY. Mr. Chairman, I am sorry to take so much time. I have one followup question to ask.

It seems to me you have helped me identify the question I should have asked and that is: Since we need to put more money into R&D in the new direction should we not, as Mr. Mendelowitz suggested, go back and review the places where it is going because it always went the way—one of them may be restyling the automobile.

Dr. ZYSMAN. I agree with that. We thought about this problem a great deal particularly with the R&D tax credit being on marginal increases. That is the reason why I suggest to some extent that we select a level of R&D as a percentage of corporate revenues. General Motors quite apart from everything else spends as a percentage of its expenditures a dramatically lower percentage of money on R&D.

Mr. MACKAY. You are saying they have got to spend up to a certain threshhold before we start matching it?

Dr. ZYSMAN. Yes, sir, and we take that as a given that certain kinds of rules won't apply unless you are a heavy investor in R&D and that probably there will be abuses of that but the abuses would be dramatically lessened.

Mr. MENDELOWITZ. That is in concert with the point I was trying to make earlier about insuring that any Federal initiative in this area supplements and encourages the private sector resources rather than replaces them.

Mr. MACKAY. Excellent.

Mr. GORE. Thank you very much.

First, let me say I think this panel has been just fascinating and extremely helpful. One subject that really has not been touched is the subject of consensus building and its role in the Japanese economy. One witness who we had hoped would be able to participate in these hearings but had to back out for unavoidable reasons at the last moment was William Ouchi the author of the theory and the author of a new book which is going to come out very shortly which analyzes in detail the communication within the Japanese electronic industry and other Japanese industries in the Japanese Government. And then a parallel analysis of its counterpart here in the United States. He then extrudes a number of important lessons about the consensus building and the nature of the communication between enterprises as they define strategic goals confronting that industry.

Let me say that without objection I would like to include in the transcript the remarks Mr. Ouchi made regarding this matter to the Congressional Research Service. Earlier he had presented these ideas to the Congressional Clearing House on the future.

[The information is contained in appendix II.]

Mr. GORE. Mr. Mendelowitz, would you elaborate on your view of the theory of consensus building in Japan. What is the role of consensus building in MITI's formation of industrial policy and what can we in the United States learn from the consensus building approach to Japanese decisionmaking?

Mr. MENDELOWITZ. I think that we should distinguish between the process of consensus building and the actual achievement of consensus.

The process of consensus building in Japan brings the divergent interest groups together to jointly try to reach a common understanding of the desirable direction to move in the society and this process of coming together to exchange views and interests and concerns is beneficial in and of itself because it puts everyone on notice as to where society or the economy will move.

It allays fears and it makes the process of change easier because there is advanced notice for change and implications for different sectors.

Mr. GORE. Let me interrupt you there to say when Americans hear a description like that they tend to think in terms of something like an encounter group where the participants all sort of feel better and they think that they are moving in the same direction. In fact, it is a very intensive process that lasts for a long period of time each year with representatives from different levels of these companies taking place in very intensive efforts to identify not just the general directions in which the industry will move, but specific problems that affect the relationship of that industry to other industries in Japan. My understanding which is derived almost solely from Mr. Ouchi's analysis is that when they flash through what is identified problems that address industry as a whole, then and only then do they take it to the next level up which is counsel involving representatives of that industry and other industries and only then does it go to MITI.

Now, I am going to ask Mr. Arai to comment on this in a moment but I interrupted you to clarify the nature of that effort. I used to hear this and think in terms of kind of a vague, general, "we are going to move forward this year."

Mr. **Mendelowitz**. It depends on the level that these discussions take place. For example, when you are dealing with an expanding market and expanding industry it is much easier to achieve consensus when you are dealing with a distressed industry. In the case of shipbuilding I believe the negotiations between government, industry, unions, and the shipbuilding industry went on for 5 years before agreement was reached on the restructuring plan. In the case of the aluminum industry negotiations went on for many years and no agreement was ever reached so that I just wanted to reemphasize the point that you made about the detailed nature of these negotiations.

But the fact that they do take place does not guarantee that consensus will be reached and a plan will be reached.

In the case of these depressed industries the type of agreement they are trying to come to is, in fact, a government sanctioned plan in which government credits will be used to assist small- and medium-size firms to contract a capacity. Large firms make a commitment to contract capacity, retrain workers and move them around and things like that. So, they are dealing in fact with what is on the table is a contract between labor, industry and government as to what steps will be taken to try to rectify the situation.

Mr. **Gore**. Mr. Arai, do you want to comment? Am I moving from one myth to another about the consensus building approach?

Mr. **Arai**. Well, essentially Japan is a driven society. It has no natural resources. It does not have the aggregate wealth that the United States has and this situation has been acutely realized by people in different sectors.

In order to come up with the future policies and the programs so that they always get together to develop the strategic forcast of what may or may not happen in the world 20 years hence. In order to come up with that forecast they have somewhere around 140 experts outside of the government getting together and forming several committees coming up with suggestions and their own estimate as to what might take place 20 years hence.

Now, this strategic plan is usually submitted to the Minister of the International Trade on Industry to use such information in formulating the Ministry's policies on the programs. However, in the process of MITI coming up with long range plans in the strategic forecast they always look toward the private sector input which includes not only businessmen but also academicians, labor unions, and whatnot.

As Mr. Ouchi pointed out in his new study in order for the single group to come up with a consensus, the Japanese very extensively go through the negotiations and they know the need for making conciliations before they can agree on any future policies in programs or even on the forecast. Thus, you see on all the different regional as well as national levels and the product-oriented associations you have constant meetings which finally result in the upper level of the meeting with the government officials who received the private sector input so that they may also reflect the thinking of the private sector in the final formulation of government policy.

Mr. **Gore**. Dr. Zysman?

Mr. **Zysman**. This process of consensus building really represents a part of what we are calling controlled competition. Where do you get the rules that structure and control competition? I think we have to separate out several parts of that consensus building. One part of it is an information diffusion process. Jean Monet who formulated the French plan once said that the French plan was fundamentally an exercise in adult education and I think there certainly is a part of that in that part of the consensus building is certainly something that is easy to adopt and certainly useful in thinking through national goals.

The second part of this in terms of authoritative decisions, the operations of markets which really means the sharing out of markets, the formal specialization of products is not something which is very helpful in the system. It is something which is perfectly acceptable in Japan as long as it does not affect the access of the United States to those markets and does not affect the ability of Japanese companies to compete in the American markets.

As a general issue, our group sharply disagrees, I should say with Mr. Ouchi for the role of Japanese culture. I think it is a very simple interpretation of most of the outcomes the Japanese economy could be arrived at by simply extrapolating the consequences of very rapid growth. That is what differentiates companies from everybody else is that they are very rapidly growing companies. Very rapidly growing companies are very flexible. Most of the outcomes that we look at in Japan are thank heavens not simply a product of Japanese culture. If they were a product of Japanese culture then, in fact, it would be very nation-specific and in a certain sense most of American efforts to respond would be doomed to failure. We don't think that is the case and we think we can respond quite effectively to those.

Mr. **Gore**. Mr. Mendelowitz.

Mr. **Mendelowitz**. We should remember also, I believe, that there are many industries that developed in Japan independent of any direction or assistance or consensus on the part of the Government. MITI's vision of the automobile industry was two firms which served the domestic market and did not export. They tried to discourage Honda from making automobiles. The consumer electronics industry is an industry that developed essentially on its own. Companies like Sony are fiercely independent and achieved their product development and market standing based on their own initiative.

Mr. **Gore**. Did you want to comment, Mr. Arai?

Mr. **Arai**. Well, Japanese go through the process just as Americans through many mistakes as well as successes. I think in discussing the Japanese issue sometimes the success side of the story is overexaggerated so that Japan will appear to many Americans as a future giant in the global market. On the other hand, in disputing that view, you tend to overemphasize the failures or weaknesses of the Japanese economy as well as the society. I think it is essential that both Japanese and Americans, with an analytical approach view the situations that exist in Japan as well as in the United Sattes so that we can come up with a balanced point of view.

Mr. GORE. Well, we could go on with questions to this panel for quite some time but in the interest of time and as a courtesy to our next panel which we want to get to we are going to have to forego asking further questions but I would like to thank all three of you for excellent presentations and responses and the fine contributions to our efforts to understand this better. We appreciate it very much.

Our final panel is made up of Dr. Edward Feigenbaum of Stanford University and Dr. Robert Cooper, director of defense advanced research projects, often referred to as DARPA.

Gentlemen, if you would come forward.

We are delighted to have both of you with us here today. Dr. Feigenbaum, we want to begin with you. Let me note in introducing you that you are also the author of an important new book entitled "The Fifth Generation Computer" and it has been a help to us in organizing these hearings and we appreciate your presence here. Without objection, your prepared statement will be included in full in the record and we invite you to proceed.

STATEMENT OF DR. EDWARD FEIGENBAUM, STANFORD UNIVERSITY

Dr. FEIGENBAUM. Thank you, Mr. Chairman. I have a feeling having heard the previous testimony that my remarks will be in the nature of a case study instead of a set of generalizations. My own field of research has been for many years, artificial intelligence, research. You have heard that term mentioned several times this morning in connection with the fifth generation project and I have been on sabbatical in Japan and visited many laboratories and as a consequence of much study of the fifth generation project in fact, I was one of those speakers referred to by Mr. Arai who participated in the final stages of the fifth generation plan formation. I was able to coauthor that book on the fifth generation.

Let me just make some remarks then about the project. What is the fifth generation project that you have heard about? It is a remarkable and audacious 10-year research and development effort aimed at developing computers and software that the Japanese will use and sell in the mid-1990's and beyond.

Traditionally we have labeled computer generations by the hardware that is employed in those generations. For example, vacuum tube hardware or transistor hardware or various types of integrated circuit hardware.

The hallmark of the fifth generation in the slogan coined by the Japanese is the use to which the computer will be put. The fifth generation computers will be engines for artificial intelligence, not merely for traditional calculation or data processing. In artificial intelligence the aim is to program computers to reason using knowledge. Thus, the fifth generation reflects the Japanese view that in the 1990's we will all be making the transition from machines that calculate to machines that reason. That this transition will be extremely important in human affairs and will open up a vast new market in information processing. The Japanese have a slogan for that too. They call it the knowledge industry. The Japanese view knowledge as the new wealth of nations, similar to oil, natural resources, and agriculture.

In the U.S.A., there is a growing consensus that this view is correct. A panel of the Defense Science Board, convened for a summer study in 1981 to assess the impact of many different technologies on the defense of the country in the 1990's, ranked artificial intelligence second on its "opportunity" list—the opportunity to make an order-of-magnitude impact on defense. Business Week, in its cover story on artificial intelligence in 1982, subtitled the story "The Second Computer Age Begins." I personally regard this as not merely the second computer revolution, but the important one. And Fortune magazine, in its series on "Thinking Machines"—May-June 1982—began:

> The appearance on earth of a nonhuman entity with intelligence approaching or exceeding mankind's would rank with the most significant events in history.

We are at an early stage in this development, but the Japanese are moving energetically, with their usual skill and diligence, to get there first with the best products.

The Japanese Ministry of International Trade and Industry has set a goal for Japan to be No. 1 in the world computer industry in the late 1990's and beyond. Since we dominate this market so completely today, a nontraditional strategy is called for. The MITI strategy has been to envision what the explosive markets for information processing in the future will be and to get there first, ahead of American firms that have not yet seen or appreciated these markets. No longer will they choose to imitate IBM. The Japanese choice is the area of artificial intelligence applications and associated computers. So, we have the goal and we have the strategy. Now what about the tactics.

To implement its strategy, MITI and the major companies of the computer industry of Japan have established a central national institute, the Institute for New Generation Computing Technology (ICOT), and parallel proprietary laboratories in each of the companies. Leadership for ICOT came from the MITI Electrotechnical Laboratory and from NTT—Japan Telephone and Telegraph Company. The participating companies are: Fujitsu, Hitachi, Nippon Electric Corp., NTT, Matsushita, Mitsubishi, Oki, Sharp and Toshiba. Each company contributed five young scientists, the "best and the brightest," according to ICOT's Director Fuchi.

The work at ICOT is open and nonproprietary. There are many visits by Americans and Europeans, and open publication. There are no ICOT secrets. The Japanese call this "the precompetitive phase." Technology transfer is done by people moving back and forth between ICOT and the proprietary labs. One of the company people goes back to his company's proprietary laboratory for 1 day every 2 weeks, to inform his lab of what has been transpiring at ICOT. At the end of the first 3-year phase, the company scientists and engineers at ICOT will return to their proprietary labs to provide the leadership for competitive proprietary developments, and a new group from the companies will be sent to ICOT for the next phase.

The fifth generation project is guided by a daring plan that took 3 years to work out—and I might say through a very elaborate consensus gathering project that took 3 years to do. The MITI commitment of funds is $450 million over the 10-year period. The companies will match government spending after the first 3 years on a 50-50 plan, bringing to total project budget for 10 years to at least $855 million. American industry people have told me to expect the expenditure to be $1 billion or more by the end of the 10-year period. In a break with the past, the funds will flow from MITI to the companies through ICOT—by contract—and not directly as subsidy. The intent is to allow ICOT to maintain a substantial level of control and direction of the national project. That is a description. The question is should we care? My answer is yes, there is a threat.

The country that leads the world's computer industry, and that pioneered the remarkable developments in artificial intelligence and brought these to the point of industrialization, cannot risk the loss of markets in the information processing industry envisioned by the Japanese long-range goal. As we lament the decline of our more traditional industries, the computing and information processing industry is emerging as the most important industry of the late 20th century. Further, as the Japanese say in their plan, the computer industry is becoming the cutting edge of all other industrial activity. Computing is a tool not only of the knowledge worker but also of the modern industrial worker. Toward goals of national defense, we also cannot afford to lose the initiative and vigor of our computing industry. It is unacceptable for the U.S.A. to have to depend upon even a friendly nation like Japan for a vital defense technology. And DOD must preserve the ability to accelerate the technology, and shape it to its needs, working from a strong domestic capability. We cannot be put in the position of depending on some other nation's industral agenda in the service of our national defense needs.

Mr. Gore. Dr. Feigenbaum, with apologies, I have to interrupt you at that point. We have a vote on the floor and we are going to have to have a brief recess. Let me say in advance that when we come back in about 8, 9, 10 minutes, my cochairman, Doug Walgren, is going to chair the hearing to its conclusion because I have to be elsewhere, but I wanted to apologize to you, Dr. Cooper, for my absence and assure you that I have read your statement from beginning to end and I wanted to note for the record the tremendous work that DARPA has done in this area and if we are going to get back our leadership edge, certainly DARPA has a very important and prominent role to play, and I wanted to compliment you on your testimony in advance and ask both of you if you would be willing to answer some short written questions for the record later on.

Mr. Cooper. Thank you very much, Mr. Chairman. I certainly would be willing to do that.

Mr. Gore. Well, that is fine.

We will recess for approximately 10 minutes and then we will come back and finish up the hearing.

[Brief recess.]

Mr. Walgren. Let me call us back to the completion of the hearing and apologize for the interruption that necessarily takes our minds away from your presentations.

Where were we when we left?

Dr. FEIGENBAUM. I was just saying is there a threat and I said yes, there is.

I talked about not only the economic threat but the threat to our defense posture.

Now, the question that has been asked of my by committee staff and many others is can the Japanese do this?

The Japanese project is so bold and forward looking that it is unlikely to be completed successfully in the 10-year period. But to discredit it would be a serious mistake. Even partially realized concepts that are superbly engineered can have great economic value, preempt the market, and give the Japanese the dominant position they seek. As often happens in science and technology, the most important part of the creative act is asking the right question or placing the right long-term bet. I believe that the timing of the fifth generation project is exquisite, and the bet is a very good one. Indeed, in my view, the only gamble is one of timing, not orientation. The era of reasoning machines is inevitable. It is the "manifest destiny" of computing.

Now, what options do we have for an American response? I would like to summarize a few of them although in that book I go into some detail. Option zero: Nothing special, do our normal thing, hurry up later, hope for the best and it might all work out.

Option 1 is some kind of orchestrated national response. And I have considered this at some length and I would just like to present you the one I think is the best of the national responses.

The nearest thing we have to a MITI for computer technology is the Defense Advanced Research Projects Agency [DARPA]. This small but superb office within DOD has a good track record of bringing long-term research and development efforts of national importance to fruition. Though it has a defense mission, it has always acted more broadly in the national interest. Under its funding and guidance, artificial intelligence research has been nurtured for 20 years. Its successes also include such important innovations as the first national digital communications network [Arpanet], and computer interactive time-sharing systems. So Arpanet is a good bet for a national response.

Option 2: A national center for the next generation computer technology, as a manifestation of the national will to maintain our No. 1 position in the computing world. This would be an ICOT-like center, staffed by scientists and engineers from universities, the computer industry, and Government laboratories. It could be operated by a university or an association of universities (as with the Stanford Linear Accelerator Center, or the Fermilab); or it could be separately chartered and independent. In a variant of this idea, the center could take on some DARPA-like functions, contracting for some research and development in the style of a program office according to a national plan, in addition to its own inhouse R&D. Viewed this way, it looks even more ICOT like.

I added this to my testimony simply because it came up in the remarks with Mr. Arai. I was one of the participants that he mentioned in the Japanese fifth generation conference in October of 1981. I have studied their plan carefully. Let me say that it makes very strong statements about doing it ourselves, learning how to innovate in major ways on our own. In the revision of the October 1981, plan dated May 1, 1982, there is a section there entitled "Political Significance" which was not in the original plan and in that section it says the main reason for attempting to learn how to innovate in such a daring way is that other Nations have realized that computing technology is vital to their technological future and they are going to limit the amount of technology that they will allow us to have and therefore we have to learn to do it on our own if we want to have a technology-based future. In other words, I am quite skeptical and it came as a great surprise in view of all of this to hear this morning the invitation to cooperate came as such a surprise to the committee that in fact it was reflected back in the form of another question.

I am skeptical about this but I think we should look at it carefully, the idea of international joint cooperation. With our background and lead in this area and the Japanese focused orchestration and zeal an excellent result might be obtained. In fact, this was one of the options that I mentioned in a section of that book and it was also an option mentioned by William Baker, the chairman of Rockefeller University and the former chairman of Bell Labs in a statement he made which was headlined in USA Today as "Technical Alliance Urged" in which he promoted the idea of forming an alliance with Japan on the fifth generation project.

None of these may be the proper path for Americans. But we should do something. Our zeal for internal competition, bred into us by our culture, and fostered by our antitrust laws, leads to fratricide. Our industry leaders, eyes on the bottom line, are focused on the short term. They are not exhibiting the vision to look at the horizon. Our successful computing industry is complacent. Collectively we seem to lack the national will to move out and gain for ourselves important new territories in the future of computing and information processing.

To do nothing is to perform an exciting but dangerous experiment, pitting a decentralized, uncoordinated set of American activities against a well-planned and beautifully orchestrated Japanese national project. In 10 or 15 years, we will know the result of the experiment, and we may not like it.

Dr. FEIGENBAUM. I would like to close my remarks by just giving to you one personal observation.

I have tried to boil down what I think I learned from studying the Japanese plan from talking to the people I talked to and writing that book that I wrote.

Let me share with you the two observations I came to. They have nothing to do with computing.

The first is that the Japanese really believe that out to a horizon of 10 years it is possible to think through the future. There are occasional exceptions, like the invention of the transistor, which are not predictable. But other than those occasional exceptions, thinking works, planning works, in working out technological futures. That is a very impressive idea that we don't often follow.

Second, I want to reemphasize that our computer industry leaders seem to lack vision. We seem to be able to think out the next 2 to 3 years and we seem not to look at a horizon. Anything that is a tiny dot on the horizon simply does not get the attention of our computer industry leaders.

We never see a state of the union address from the leaders of our major computer industry companies.

Where are we going? What is it all about? Why are we doing this? What kind of computing and information processing future is in store for us?

There is no vision in our computer industry.

Thank you.

[The prepared statement of Dr. Feigenbaum follows:]

PREPARED STATEMENT OF EDWARD A. FEIGENBAUM, STANFORD UNIVERSITY

THE JAPANESE FIFTH GENERATION COMPUTER PROJECT (ICOT)

I am Edward A. Feigenbaum, a Professor of Computer Science at Stanford University. My field of research for the past 27 years has been the part of computer science called artificial intelligence research. My special knowledge of the Japanese computer research and development initiatives derives from many visits to Japanese institutes, industrial laboratories, and university laboratories; and a lecturing sabbatical at the University of Tokyo. The knowledge I have gained thereby led me to co-author a book on the new Japanese Fifth Generation Computer Systems National Project.

The Fifth Generation Project is a remarkable and audacious ten year research and development effort aimed at developing computers and software that the Japanese will use and sell in the mid-1990s and beyond. Traditionally, computer "generations" have been marked by the hardware technology they employ: tubes, transistors, integrated circuits. The hallmark of the Fifth Generation, in the Japanese view, is the use to which the computers will be put. Fifth Generation computers will be engines for artificial intelligence, not merely for calculation or data processing. In artificial intelligence, the aim is to program computers to reason with knowledge. Thus the Fifth Generation reflects the Japanese view that in the 1990s we will be making the transition from machines that calculate to machines that reason; that this transition will be extremely important in human affairs and will open up a vast new market in information processing (the Japanese call it "the knowledge industry"). The Japanese view knowledge as the new wealth of nations, similar to the oil, natural resources, and agricultural products.

In the USA, there is a growing consensus that this view is correct. A panel of the Defense Science Board, convened for a summer study in 1981 to assess the impact of many different technologies on the defense of the country in the 1990s, ranked artificial intelligence second on its "opportunity" list--the opportunity to make an order-of- magnitude impact on defense. Business Week, in its cover story on artificial intelligence in 1982, subtitled the story "the Second Computer Age Begins". (I personally regard this as not merely the second computer revolution, but the important one). And Fortune Magazine, in its series on Thinking Machines (May-June, 1982), began: "The appearance on earth of a nonhuman entity with intelligence approaching or exceeding mankind's would rank with the most significant events in history." We are at an early stage in this development, but the Japanese are moving energetically, with their usual skill and diligence, to get there first with the best products.

The Japanese Ministry of International Trade and Industry has set a goal for Japan to be number one in the world computer industry in the late 1990s and beyond. Since we dominate this market so completely today, a nontraditional strategy is called for. The MITI strategy has been to envision what the explosive markets for information processing in the future will be and to get there first, ahead of American firms that have not yet seen or appreciated these markets. No longer will they choose to imitate IBM. The Japanese choice is the area of artificial intelligence applications and associated computers.

To implement its strategy, MITI and the major companies of the computer industry of Japan have established a central national institute, the Institute for New Generation Computing Technology (ICOT), and parallel proprietary laboratories in each of the companies. Leadership for ICOT came from the MITI Electrotechnical Laboratory and from NTT (Japan Telephone and Telegraph Company). The participating companies are: Fujitsu, Hitachi, Nippon Electric Corporation, NTT, Matsushita, Mitsubishi, Oki, Sharp, and Toshiba. Each company contributed five young scientists (the "best and the brightest", according to ICOT's Director Fuchi).

The work at ICOT is open and nonproprietary. There are many visits by Americans and Europeans, and open publication. There are no ICOT secrets. The Japanese call this "the pre-competitive phase". Technology transfer is done by people moving back and forth between ICOT and the proprietary labs. One of the company people goes back to his company's proprietary laboratory for one day every two weeks, to inform his lab of what has been transpiring at ICOT. At the end of the first three year phase, the company scientists and engineers at ICOT will return to their proprietary labs to provide the leadership for competitive proprietary developments, and a new group from the companies will be sent to ICOT for the next phase.

The Fifth Generation Project is guided by a daring plan that took three years to work out. The MITI commitment of funds is $450 million dollars over the ten year period. The companies will match government spending after the first three years, bringing the total project budget for ten years to at least $855 million. American industry people have told me to expect the expenditure to be, by project's end, one billion dollars or more. In a break with the past, the funds will flow from MITI to the companies through ICOT (by contract) and not directly as subsidy. The intent is to allow ICOT to maintain a substantial level of control and direction of the national project.

Is there a threat? Yes. The country that leads the world's computer industry, and that pioneered the remarkable developments in artificial intelligence and brought these to the point of industrialization, can not risk the loss of markets in the information processing industry envisioned by the Japanese long-range goal. As we lament the decline of our more traditional industries, the computing and information processing industry is emerging as the most important industry of the late twentieth century. Further, as the Japanese say in their plan, the computing industry is becoming the cutting edge of all other industrial activity. Computing is a tool not only of the knowledge worker but also of the modern industrial worker. Toward goals of national defense, we also can not afford to lose the initiative and vigor of our computing industry. It is unacceptable for the USA to have to depend upon even a friendly nation like Japan for a vital defense technology. And DOD must preserve the ability to accelerate the technology, and shape it to its needs, working from a strong domestic capability. We can't be put in the position of depending on some other nation's industrial agenda in the service of our national defense needs.

The Japanese project is so bold and forward-looking that it is unlikely to be completely successful in the ten year period. But to discredit it would be a serious mistake. Even partially realized concepts that are superbly engineered can have great economic value, preempt the market, and give the Japanese the dominant position they seek. As often happens in science and technology, the most important part of the creative act is asking the right question or placing the right long-term bet. I believe that the timing of the Fifth Generation project is exquisite, and the bet is a very good one. Indeed, in my view the only gamble is one of timing not orientation. The era of reasoning machines is inevitable. It is the "manifest destiny" of computing.

What options do we have for an American response?

Option 0: Nothing special. Hurry up later. Hope for the best.

Option 1: An orchestrated national response. The nearest thing we have to a MITI for computer technology is the Defense Advanced Research Projects Agency (DARPA). This small but superb office within DOD has a good track record of bringing long-term research and development efforts of national importance to fruition. Though it has a defense mission, it has always acted more broadly in the national interest. Under its funding and guidance, artificial intelligence research has been nurtured for twenty years. Its successes also include such important innovations as the first national digital communmications network (ARPANET), and computer interactive time-sharing systems.

Option 2: A national center for the next generation computer technology, as a manifestation of the national will to maintain our number one position in the computing world. This would be an ICOT-like center, staffed by scientists and engineers from universities, the computer industry, and government laboratories. It could be operated by a university or an association of universities (as with the Stanford Linear Accelerator Center, or the Fermilab); or it could be separately chartered and independent. In a variant of this idea, the center could take on some DARPA-like functions, contracting for some research and development in the style of a program office according to a national plan, in addition to its own in-house R&D. Viewed this way, it looks even more ICOT-like.

None of these may be the proper path for Americans. But we should do something. Our zeal for internal competition, bred into us by our culture, and fostered by our anti-trust laws, leads to fratricide. Our industry leaders, eyes on the bottom line, are focused on the short-term. They are not exhibiting the vision to look at the horizon. Our successful computing industry is complacent. Collectively we seem to lack the national will to move out and gain for ourselves important new territories in the future of computing and information processing.

To do nothing is to perform an exciting but dangerous experiment, pitting a decentralized, uncoordinated set of American activities against a well-planned and beautifully orchestrated Japanese national project. In ten or fifteen years, we will know the result of the experiment, and we may not like it.

Please accept my thanks for giving me the opportunity to present my views in this most distinguished of all American forums.

Mr. Walgren. Thank you very much, Dr. Feigenbaum. Your statement was powerful and clear-cut.

Dr. Cooper, we would be very happy to hear your thoughts.

STATEMENT OF DR. ROBERT S. COOPER, DIRECTOR, DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Dr. Cooper. Thank you very much, Mr. Chairman.

In considering what to emphasize in my summary remarks, prior to the questioning, I picked out a couple of topics which I would like to just bring to your attention as a key to the two issues which your staff put to me before I came over here.

The two issues were: Is U.S. industry postured to compete with the Japanese in this fifth generation computer area and, if not, what should we do about that.

Second, just what is my view of the role of defense and particularly of the Advanced Research Projects Agency in meeting the threat from Japan.

I would like to take the first of those two questions first.

I guess I am not as pessimistic as Dr. Feigenbaum is about the posture that the U.S. computer industry has to meet the "threat" from Japan. I think that the industry is vital. There are good ideas there. There is more than enough resource available to the industry to meet that threat, and really all that it does require is some time to get its act together. There are all kinds of signs that that is happening around the countryside, and I believe that we should be optimistic that that will happen.

I know that you have had some testimony earlier today from some of the research consortia that have been put together for cooperation in the research area in industry.

So I believe that acting in this relatively unstructured way that we do in this society, both in the Government and in industry, that we will finally get our act together, and the power of that industry is such that we will be a most formidable and competitive opponent for the Japanese in the markets of the 1990's.

One thing that hasn't been pointed out is implicit in one of the remarks made by Dr. Feigenbaum about the goal that the Japanese have, to essentially become foremost in the computer industry in the 1990's.

In other words, the threat that Japan poses is a threat to the IBM Corp. The IBM Corp. is still the predominant power in the world in computing, and it is only to the extent that the IBM Corp. itself recognizes the threat and chooses to take action that at least in the intermediate term we can be competitive. And I must say that in formulating the defense programs in this area for the fiscal year 1983 budget year, which was accomplished in the late 1981 early 1982 time period, I was most dejected in discussing with the IBM executives their view of the Japanese threat and their view of the long-term market potential in the United States.

But I must say that in recent months, in continuing discussions with IBM on a variety of research issues, I found that their attitude in this area has completely reversed, that they are more than forthcoming in their discussions with the Government now about what they intend to do and their modes of cooperation.

They are most realistic about the potential that the Japanese have for successfully competing with them and to further reduce their 70-percent market share now to perhaps something considerably less than that in the 1990's.

So I am optimistic about that, and I believe that in that area of our competitive posture in the industry, both from a basic research point of view and from the key companies in the industry, that we are an awakening giant in that particular area.

I want to point out that when Admiral Inman talked with you earlier he did not list IBM as one of the key companies who are participating in his research consortium. In discussions last year with the key executives in the IBM Corp. with those folks who at that time, apart from Admiral Inman, were planning the creation of this new research corporation, I got the distinct impression that what was really at the basis of IBM's reticence about participation in that was the threat of the antitrust actions that might ensue or even the appearance of impropriety that might ensue if IBM were to participate in this endeavor. And I find it surprising that IBM is not a participant in these hearings because, from the standpoint of the Japanese, the IBM Corp. is the major target of their activity.

So, in this general area, I would guess there are two key Government actions that could take place that would help in this general area, even though I feel that we are in a position of being able to be competitive with certain key situations still in front of us.

The first thing that we could do would be to stimulate investment in the industry in basic research and early exploratory development activities, and that is where the industry is falling down and has fallen down for the past few years because they have had their eyes firmly fixed on the bottom line.

The next quarter's return on investment, and clearly they have neglected to a large extent the longer term research which is represented by the kind of activity inherent in the fifth generation computer, and I want to point out that results in this area are certainly 5 and possibly more than 10 years away.

So investments now cannot hope to gain returns until the far distant future, certainly from the standpoint of industry. Now, from ARPA's point of view, that is not quite right because ARPA always invests in things that have payoffs beyond 5 years and many beyond 10 years, much to the consternation of some Members of Congress, I might add.

So if I were to counsel you as to the one single thing that you could do most, if you can help industry to give incentives for long-term basic research and early exploratory development in the diciplines related to super intelligent computers, the fifth generation type of activity, you will have gone a long way toward helping them to make the key decisions that they need to make.

Second, I think the decision that was characteristic in IBM's non-participation in MCC is to remove the antitrust pressures that those large companies, both the specialized computer companies and the large research conglomerates that have large computer elements in them, to relieve some of their anxieties about the ever present threat of Government intervention in antitrust actions.

On the second question, the question of the role that ARPA has in this overall area, Ed previewed that from a historic point of view, but I want to emphasize that although I have only been with ARPA for a little shy of 2 years now, I know from past experiences that ARPA is the forward-looking investor in computer science and microelectronics technology in the Government.

Second only with a very distant second place would be the National Science Foundation and, third, to a certain extent, the Department of Energy, and all others recede to the background. So ARPA has been, by choice and by default to a certain extent, the primary contributor to basic research funding by the Government in computer science and microelectronics technology for the past 20 years.

So that role certainly will continue in our present level of funding, which is around $80 million a year into those two general technology areas, will certainly continue as a basic research program.

But we do, indeed, plan and have been planning for well over a year now, major new investments in the technologies associated with the fifth generation computing, completely independent from the Japanese initiative itself, dependent only on two factors.

One is perceived need for this technology to be available to defense in the 1990's time period so that we may retain our national security lead over the Soviet Union against the substantial threats that we see off in the distant future.

And, second, the opportunity that we see to make a major investment that defense has made through the defense advance research projects agency over those 20 years pay off by transitioning that technology as rapidly as possible to create entirely new capabilities for our forces.

So it is both demand pull, that is the demand required for us to meet our national security needs in the 1990's, and the opportunity that we have created for ourselves by these substantial investments in basic research over the last 20 years that allow us now to do this.

I think it is very interesting that the Japanese have come into the United States in the past 3 years and by viewing the progress that has been made mainly in the ARPA programs, it has come to a conclusion similar to the conclusion that we have in defense: That is in order to meet our defense needs we should capitalize on this tremendously attractive technology area that has been created.

And they have come to the conclusion that they should capitalize on it for their own commercial purposes. It is only hoped in this country that the industry in the United States will see the opportunity to also move rapidly in this area of superintelligent computers to meet commercial industry needs and to keep that industry strong and vital.

I want to point out that subsidiary interests on our part in defense is that we view the Japanese as our friends. That is they are our allies in the defense of the free world and we have agreements with them and arrangements with them which are tremendously beneficial to the United States. So defense cannot view the Japanese as a threat. But there is an implied threat there if they make serious inroads into our commercial marketplaces and cause the basic strength of the computer industry in the United States to be diminished and unable to meet national security needs.

So we are certainly aware of that and we are certainly hopeful that any initiatives that we take in this general fifth generation computer area will aid in strengthening the U.S. companies to be competitive so that they can be strong and able to meet defense needs as they arise.

I want to point out finally that the thrust that we see in defense in the general computer area, mainly focused in the ARPA programs, will essentially meet our defensive needs and we expect that they will provide for us capabilities without which we will be in a very disadvantageous position with respect to the Soviets in the 1990's.

So we view this as an absolute necessity for defense and we are requesting from the Congress over the next few years very sizable increases in the ARPA research program to make these long-term investments which we think are so vital, and all the help that you folks can give us would be greatly appreciated.

That concludes my initial remarks and I would be happy to join with Ed in answering any questions you may have.

[The prepared statement of Dr. Cooper follows:]

PREPARED STATEMENT OF DR. ROBERT S. COOPER, DIRECTOR, DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

I appreciate the opportunity to respond to your invitation to discuss my views on Japanese initiatives in the area of computer technology. While I am not in a position to address Japanese industrial policy or legal obstacles to joint research ventures in the U.S., I would like to comment on the desirability of providing increased support for computer R&D in the U.S., our efforts at DARPA to develop super intelligent computers, and the need for further strengthening of our industrial base for defense.

Several joint research ventures have been initiated in the U.S. in the last year or two. I believe these to be in the national interest as they have the desired effect of providing additional funding for research. By combining forces, companies can also spread the risks and costs of major new enterprises, such as the development of a Fifth Generation Computer, and combine key personnel who may have complementary talents. The result can be a major advance for the industry as a whole, with benefits in both the civilian and defense sectors.

Continued support for microelectronics and computer R&D is the only way we can assure our technology base rests on the latest and most powerful ideas in the scientific community.

Until very recently, Government support in these areas was largely level of effort funded, although industry itself has invested heavily in both computer and microelectronics to meet near term requirements. As a result, we have a well developed commercial marketplace, which the Japanese are taking dead aim on, but little in the way of advanced computer technology has made its way into Defense. We see a need for a two-pronged approach to the problem.

First, we must invest heavily in the kind of long-range research which will insure that the U.S. has the know-how to retain its leadership role in the 1990's. This is particularly important for Defense and may be equally important for the economic well being of the nation. Second, the industry must learn to deliver products which compete favorably in overall quality, reliability, and cost while improving productivity wherever possible through the use of technology, better management, and a highly motivated work force.

We are beginning a major new effort to develop super intelligent computers based on DARPA's new research program in Strategic Computing and Survivability. We plan to capitalize on university and industry research through joint efforts wherever possible.

The DARPA research program is aimed at meeting defense needs. However, the technology that we will be developing is very basic and should have spin-off benefits in numerous civilian applications. We normally coordinate our program with other research efforts in the U.S. and plan to include the new industry research joint ventures as well. The nation needs significantly more research in the computer and microelectronics areas. Activities such as the recently created joint research ventures appear to be viable mechanisms for further advancing the state of computer science and technology and we support them for that reason.

I want to summarize my general views on the nature of two key Japanese programs in Supercomputers and Fifth Generation Computers, considering not only technical directions but also the organizational factors that make these ambitious efforts possible. These two programs have quite different goals, the former to develop extraordinarily powerful numerical processing machines and the latter to develop a new kind of super intelligent computer. Then, I would like to briefly describe the new DARPA program that is planned in the area of Strategic Computing. The DARPA program is directed at meeting critical defense needs for the 1990s, but spin-off effects of the program can have a major impact on future U.S.-Japanese commercial competition in both of these areas.

The Japanese Supercomputer program is exploring new electronics technology and computer architectures for producing very high speed "number cruncher" machines. These machines will do the arithmetic calculations needed for such applications as wind tunnel simulations, weather prediction, nuclear effects calculations, and general signal processing. These kinds of calculatons are characterized by three factors First, many parts of the calculation are sufficiently independent that they can be performed in parallel - at the same time - in order to reduce the total time to completion. Hence, a multiprocessor architecture is the candidate of choice. Second, the fundamental calculations are numerical - that is, arithmetic. Third, the computational requirements of each calculaton are repetitive and predictable. Of course, each new wind tunnel calculation or weather prediction yields different results, but the amount and kind of calculation is essentially known in advance. Historically, a handful of U.S. companies have supplied the small market for machines of large processing power for these limited applications.

The Japanese Fifth Generation Computer initiative is developing both high speed microelectronics technology and computer architectures for efficiently performing very different kinds of calculations, namely those needed by intelligent computers for performing such tasks as inferencing, planning, reasoning, decision making, hypothesizing and learning. In performing these tasks, such computers have to access very large collections of underlying knowledge and may need sensory inputs similar to those found in humans, such as vision. Such Fifth Generation Computers bear little resemblance to "number crunchers". The fundamental kind of calculation that is performed by a super intelligent computer is symbolic or logical, not numerical. Thus, for example, it is important to be able to calculate the truth or falsehood of propositions, or make logical inferences and perform billions of such calculations at high speed. More significicantly, such Fifth Generation Computers differ in that the calculations are neither repetitive nor predictable. A particular reasoning task might be modest or massive, depending on small details of the problem, and there is no way to know just what calculations will be required in advance. Thus, the architectures of Fifth Generation Computers place an extremely heavy demand on flexibility and responsiveness to widely varying requirements.

In pursuing both of these development programs, the Japanese are exploiting ideas in the areas of microelectronics, computer architecture, software, computer communication, and algorithms. Ironically, most of these ideas have been developed by U.S. researchers, primarily in universities, under DARPA support, during the last decade. The Japanese have shown outstanding talent in selecting the best technical ideas, including ones that have been essentially ignored by their competitors, and they have initiated a well organized and highly directed effort to transfer these research ideas into commercial products. Their program involves highly centralized management of product development, an approach that may not be suitable in the culture of the U.S. computer industry. I am not suggesting that the Japanese are unable to develop their own new research ideas - this is patently false - but rather that as a matter of policy they have decided to concentrate their efforts, at this time, in the area of technology transfer.

In doing so, they have been immeasurably aided by Japanese Government policies, financial incentives, and central management that strongly encourage cooperative ventures of this sort among Japanese computer companies. As such, the risks associated with such ventures are spread over the stockholders of a number of companies, and in fact over the population of the country as a whole. Further, the financial burden of such technology transfer, can also be spread over a large group. Finally, corporate resources that might otherwise be spent competing among Japanese computer companies can be directed toward a long term goal that may significantly aid Japanese industry as a whole.

There has already been a U.S. industrial response to these Japanese activities. Both the Microelectronics and Computer Technology Corporation (MCC) and the Semiconductor Research Corporation (SRC) are joint industrial ventures that are intended to bring U.S. industry a measure of the same advantages enjoyed in Japan. I believe these activities are useful and in combination with Government efforts will lead to significant advances in the U.S. computer industry.

Turning now to the new DARPA program, in the FY84 President's Budget we requested $50M to begin a new program called Strategic Computing and

Survivability. This program will be aimed at developing a technology base for Defense applications of super intelligent computers in the 1990s. The emphasis in the program is in the area of symbolic processing rather than "number crunchers". The effect will be to provide major new capabilities for future Defense requirements, and the commercial spin-offs will help the U.S. computer industry to meet, and in fact surpass, the Japanese activities addressed above.

I would like to draw the broad outlines of our approach. In our program we intend to address several critical technological areas, strengthen the ties between U.S. universities and U.S. computer companies and assist the university education process to increase the training of personnel in these critical areas. The technological areas we will address are microelectronics and VLSI systems, computer architectures, generic software technologies, and initially we will focus attention on three specific military applications.

Underlying both "number crunchers" and super intelligent computers that do symbolic computations is the requirement for ultra-high speed electronic components that are compact, require little power, are highly reliable, and can survive levels of radiation in space and under battlefield conditions. To this end we are investigating VLSI circuits using GaAs; schemes for optoelectronic interconnections; and new ideas in packaging and VLSI architecture. Advances in these areas will be broadly applicable to new computers of many sorts, and can yield one or two orders of magnitude improvement in performance.

A major emphasis is in the area of computer architectures for symbolic computing, for super intelligent computers. These will involve large numbers of processors - perhaps millions - in order to do as many calculations at the same time as possible to speed up the time to solutions. Because of the irregular and somewhat unpredictable nature of the calculations underlying intelligent behavior, the architectures have to be highly flexible so as to respond to unanticipated demands. In addition, we intend to address special purpose architectures for extremely high speed signal processing applications. Such calculations are needed for computer vision, and to a lesser extent for computer speech understanding, which will be needed for super intelligent computers of the future. Finally, super intelligent computers will need high speed access to very large amounts of information. Thus we will examine different architectures for dealing with very large data bases and knowledge bases. Again, there will be corollary benefits from this work in more traditional areas. We hope to achieve three or four orders of magnitude improvement from these architectural efforts.

The advantages of high speed electronics and efficient computer architectures for symbolic processing will be obviated unless we also develop generic software systems to perform the tasks that underly many applications that will face super intelligent computers. To this end, we have elected to fund research in the software required to achieve such generic applications as natural language understanding, speech understanding, computer vision, image understanding, and several others. To pursue one example, success in computer vision will allow such disparate applications as the automatic analysis of very large numbers of images in real time; and the construction of autonomous vehicles that can perform military tasks for periods as long as months without human intervention. These generic software systems will also find many applications in the civilian sector.

We are pursuing these technologies to form the basis of future Defense systems, and several concept demonstrations will be developed during our program. An application we are considering is a battlefield assessment system that will intelligently combine the information from a number of sensor sources, even if the information is inconsistent or incomplete, in order to provide the theater-level commander with an overall view of the battlefield situation as an aid to planning. The problem addressed is that with increasingly massive amounts of valuable data collected, no commander can possibly keep up and make full use of the information. Adding more personnel will actually make the problem worse - each will see a smaller and smaller percentage of the information, making an accurate overall picture even less likely. Another application is in the area of autonomous systems. These will be a generation beyond today's "smart" munitions and cruise missles. They will be able to pursue long term missions, perhaps measured in weeks or months, during which they will intelligently plan and reason in order to achieve their goal. Finally, we are considering planning and advising systems such as an intelligent pilot's cockpit assistant. Such a cooperative system may analyze various kinds of sensor data, control weapons delivery at high speed, and manage the aircraft functions so as to achieve mission objectives and maximize safety for the pilot and crew. Thus the pilot would be elevated to the position of aircraft commander, freeing his intellectual resources for tactical planning and decision making, in terms of overall objectives.

All three of these concept demonstration systems contain basic technology that might also be used in a number of civilian applications, such as national air traffic control or energy management, robotic vehicles for undersea surveying or mining, and, of course, civilian aircraft safety systems.

In additional to the technological objectives, we intend to encourage cooperative arrangements involving universities and corporations. The purpose is to close the technology transition gap in the U.S. Our direct goal is to assure the availability to the Department of Defense of the best possible future computer systems from U.S. suppliers at the earliest possible time. Another benefit that will occur is to provide U.S. computer companies with even wore advanced tecnologies than those being pursured in Japan.

Finally, part of our resources will be devoted to significantly increasing the number of graduates in computer science and associated areas at both the Masters and Doctorate level. This will provide Defense industries with sorely needed personnel within the lifetime of our program, and will add to the next generation of university teachers in these disciplines.

To summarize, our new program in Strategic Computing and Survivability has been developed in order to meet the long range requirements for Defense. It will develop the technology base for future super intelligent computers with greater capabilities than currently anticipated from industry and apply these to important Defense problems. It will strengthen the ties between the U.S. computer industry and U.S. research institutions and universities to close an existing technology transition gap - a gap being exploited by the Japanese; and finally, it will significantly increase the number of trained computer professionals in the U.S., in order to provide researchers for industry and Government today and to provide more teachers of scientists for tomorrow.

Mr. WALGREN. Thank you very much.

Dr. Feigenbaum, one of the previous witnesses in talking about the possibility of joint efforts was skeptical and indicated that the ground rules would have to be restructured in terms of, as I understand it, the way we compete with each other, the use that we make of each other's intellectual property as well.

My question is: How do you view the economic competition between the United States and Japan? Are we following the same ground rules? Is the necessary respect for each other's inventiveness being afforded to each other so that there is not an unfair advantage taken?

Dr. FEIGENBAUM. You mean between us Americans and the Japanese in the international competition?

Mr. WALGREN. Yes, sir.

Dr. FEIGENBAUM. I have a feeling, and I don't know the complete answer to your question, but I have a feeling that most of the damage that is done we do to ourselves. I have found, personally, as an academic researcher, that the Japanese are very open. They allow me to visit their laboratories. They talk about everything they are doing.

To the extent that they can't talk about it they are very much up front. They say, well, we have moved this from this lab to this lab for proprietary reasons. We can't let you in there but we will bring someone from over there to talk to you. They are quite open.

ICOT is a completely open outfit. They are even arranging to publish an English language journal called Next Generation Computing, so others can find out what they are doing in English. The trouble we bring ourselves has been mentioned today. It has been said that the Japanese publish in a private language. That is our fault. Almost every Japanese scientist I have spoken to speaks reasonably good English. I give all my lectures in English. But how many of us know Japanese? No one has taken the time to do that.

We simply don't read their stuff and we don't know what they are doing and we don't communicate with them very well. So I think a large amount of the problem is our own. I do feel that the restructuring that you mentioned inside the American cooperatives is going to be a very difficult thing to cope with.

One of the people who participates in NCC told me that when he sits across the table at NCC meetings it's very hard for him to get out of his head that the guy across the table is the enemy, whereas at ICOT there is no feeling like that at all. In fact, the companies themselves are worried that the people they send to ICOT will lose this highly treasured colloquiality because they are so participative at ICOT.

Mr. WALGREN. Along this line, Dr. Cooper, are we doing things at ARPA that we want to see remain proprietary to the U.S. economy or is everything we do there absolutely open and immediately transferred in that sense to whatever another country's economy would like to try to make of it?

Dr. COOPER. The results of the technology programs at DARPA fall into three categories. One category is open and and disseminated research results without restriction.

The second category is research results that are subject to the international arms control regulations and the third is classified research. All three kinds of activities are carried on in our research programs in this general area by computer science and microelectronic circuitry.

Mr. WALGREN. Now, in that sense, every effort that is available to IBM from DARPA's program is also openly available to any foreign competitor?

Dr. COOPER. Many of our openly published research results are generally available both abroad and here in the United States, but we do have a number of research results that are subject to the restrictions that have been placed on some research results in some areas, those areas that have been specified as critical technologies in the militarily critical technologies list. So we do control some information to be available only in the United States which is not classified per se.

Mr. WALGREN. I see.

Mr. MacKay.

Mr. MACKAY. Dr. Feigenbaum, you indicated you were skeptical about the Japanese invitation to cooperate, and it seems to me we are now in a position where we are saying the solution to international competition lies in allowing and encouraging cooperation among companies that formerly prohibited cooperation within our boundaries, within our borders, but actually maybe even discouraging companies from cooperating across international boundaries, across national boundaries.

I am wondering, it seems if we really are in an international competitive arena and Japan is an ally in their democratic society and our futures are sort of irretrievably bound up militarily, it seems to me we ought to be encouraging cooperation.

In other words, it seems to me we are playing by a smart set of rules, one of which is an anachronism or a holdover from the past. Capital now flows. There are no international boundaries to capitalism. We are not threatened by that. So we are partly international and partly not.

Why would you say you are skeptical about that?

Dr. FEIGENBAUM. Let me clarify what I meant by that. I am skeptical of the Japanese interest in doing it although they have said words about international cooperation. I have read all of their documents on the fifth generation and I know how many times it says we have to train ourselves to do this.

We have to learn to innovate. We have to do exciting projects on our own. It doesn't sound like they are inviting international cooperation.

Mr. MACKAY. But you said, I thought because they feel certain and we might not share with them and they feel that they woul have to——

Dr. FEIGENBAUM. No, no.

Mr. MACKAY. I thought you said there was a political dimension that had been added which said the reason we have got to do this is that other countries are going to see this as something they must control.

Dr. FEIGENBAUM. That is correct. That was a quote from the May 1982 revision. I think the idea of cooperation with the Japanese is intriguing. I think there are tremendous strengths. As Science magazine reported several weeks ago and Newsweek discusses this week, they essentially lifted the essentials of the plan from the DARPA supported American work from the last decade. So we really have a lead. We have a lot of insight into those technologies.

They have a discipline. They have a beautifully orchestrated way of conducting a technology development and I think together those would be very powerful. In saying that in public I stirred the anxiety of our European friends who think that an alliance between us and the Japanese in this new area of technology will simply forever put them out of business.

Mr. **MacKay**. Well, I was thinking of an alliance between us and our European democratic friends which might forever stabilize some aspects of the future which is right now highy problematic. Like what's going to happen to NATO and what is going to happen to the European Community and whether we are going to get into a trade war.

Dr. **Feigenbaum**. That's a fascinating idea. The British Government commissioned a report called the Alvie Committee Report, which came out last September and has now been acted on by Mrs. Thatcher and funded by Mrs. Thatcher.

One of the statements in the Alvie Committee Report was that the participation in the British program shall not be allowed on foreign multinational companies which, of course, created a furor in American circles, and they withdrew that.

Mr. **MacKay**. The only question I would ask you, Dr. Cooper, is, I can understand where some of this would need to be classified, but beyond that do you see anything that would be threatening about, in other words, our taking a lead in the willingness to cooperate?

Dr. **Cooper**. Well, yes, sir. I think that it's dangerous to make analogies between the flow of technical knowledge across international boundaries with the flow of financial fiduciary kinds of instruments because, on the one hand, the money itself represents a good which is leveled by international trade. So in the investment money in one country or another country tends to level on the basis of trade. But it is not so for technical innovation and the things that come out of innovation.

Mr. **MacKay**. Excuse me, but that has not always been the case. Governments in the past have had policies which prevented the flow of capital.

Dr. **Cooper**. I understand that.

Mr. **MacKay**. Now we see that as an unenlightened view?

Dr. **Cooper**. Yes, sir; that is true, but the nations are in competition for markets generally and the individual companies in the countries are in competition for markets, and at least in the near term until this leveling process somehow takes place in the same way that it has in the financial community, thinking that it is in the financial interest probably to restrict the flow of technical information across boundaries.

Now, in the case of national security interest, it is absolutely clear, and in each case where we have foreign questions it is for the sharing of technological information that has to do specifically with national security, the Federal Government looks at that on a case-by-case basis and makes an individual decision in each case where there is value received in terms of national security for the kind of cooperation which is proposed by foreign countries.

I think that until we reach that nirvana where the international security is assured by the agreements we have and the actions in each nation that we take, which are according to some agreed upon international law, that we will have to continue that in the national security area.

Now, what I am proposing that you do as an analogy rather than looking toward the financial, look toward the national security interests that we try to preserve in the exchange of technical information as an analogy for where we stand today with respect to international competition in our high-tech industries. I think if we don't manage our business in terms of the flow of proprietary and highly technical information abroad that we can put ourselves at a strategic disadvantage as a nation in these high tech areas.

There may be some time in the future when we can get the kinds of agreements that are necessary both in the national security area and in the economic area to insure that the free flow of information is always the best way. But I think in the meantime we have to be careful, and I am sure that there is a closer analogy to the national security in this particular case of the fifth generation computers than there is to the free flow of finance across international boundaries.

Mr. **MacKay**. Thank you, Mr. Chairman.

Mr. **Walgren**. In fact, there was some indication here that through DARPA we laid the foundation for the Japanese to set this goal through your work.

Dr. **Cooper**. There is every indication of that; yes, sir.

Mr. **Walgren**. Would there not also be every indication that the Soviet Union would have really ready access to really anything that we transferred out to any nation like Japan and our Government effort and defense effort laid the foundation for the Soviet Union to be in the same position?

Dr. **Cooper**. We have no reason to believe that the Japanese in making specific agreements with us to protect technical information have ever violated that. We have some suspicions that Japan does represent a conduit of certain high technology materials and information to the Soviet bloc countries, but we have no specific information about that that would lead us to believe it's only a relatively benign feeling at this stage.

Dr. **Feigenbaum**. Could I make a comment about that?

Mr. **Walgren**. Yes, sir.

Dr. **Feigenbaum**. In the question of the sender and the receiver of technical information, the receptor of the technical information has to be relatively sophisticated. The receptor site has to be prepared for this information. You can say something technical to a Japanese colleague in your area and you can be sure within 3 seconds it's fully integrated to his mental model of the world and he is going to roll it forward.

Now the Russians are another story. I started to track what they were doing in 1960 when I visited there and followed their literature for another 10 years and then gave up out of boredom, and they are so far behind the power curve of that that they don't constitute an adequate receptor site. So it doesn't matter what DARPA publishes, the Russians won't be able to get their act together and administratively, or in any other way, do anything about it, in my view.

Mr. Walgren. Mr. Rheem?

Mr. Rheem. Mr. Chairman, in view of the fact that there is very little time, perhaps you could answer these two questions in writing.

Dr. Cooper, I wonder if you could elaborate on the difference between the research DARPA will be doing and the research MCC will be doing.

And, second, Dr. Feigenbaum, if you could comment on the relative merits of the private sector and what would be the DARPA research projects in this area. If there are advantages to collaboration, Dr. Cooper, perhaps you could mention whether there is going to be any. Some people might view this as redundant research.

On the other hand, it's probably very healthy, but if you could just explore some of those things for us I think it would be helpful to explain the distinction between what is going to be the private sector project and the DARPA project.

Thank you, Mr. Chairman.

Mr. Walgren. I especially appreciate your submitting these answers in writing.

[The information follows:]

Strategic Computing

Dr. Cooper. In our strategic computing effort, DARPA will be developing super intelligent computers for application to Defense problems. While the specific choice of applications will be derived from a Defense Science Board study of high priority Defense requirements, much of the underlying technology will be generic across a wide range of areas and should lend itself to many civilian spinoffs. We envision close cooperation between university and industry groups in carrying out this effort. The MCC is a joint research venture of approximately 14 computer companies in the U.S. to collectively share R&D expenses. The MCC effort is in the process of being staffed, but their initial statement of goals included work in four major areas: 1) advanced computer, design, 2) computer aided design and manufacturing, 3) software technology, and 4) integrated circuit packaging. It is expected that these MCC activities will address technological problems of interest to Defense and we plan to maintain close contact with them as their work progresses. However, interesting technological developments are also likely to take place at many other industrial activities as they have in the past, and we will also continue to monitor their progress we well. The fact that the MCC represents a collection of industrial contractors will not effect our ability to deal with it as a separate entity. We plan to work with the MCC as we work with other members of industry, but no special collaboration is envisioned.

Mr. Walgren. I am sorry, we are really out of time for the vote, but we will pursue your presentations in writing and we appreciate very much your making your presentations to us.

Dr. Feigenbaum. Thank you, Mr. Chairman, for having us.

Dr. Cooper. Thank you, Mr. Chairman.

Mr. Walgren. The subcommittee stands adjourned.

[Whereupon, at 1:10 p.m., the Subcommittee on Science, Research and Technology and the Subcommittee on Investigations and Oversight of the Committee on Science and Technology adjourned.]

JAPANESE TECHNOLOGICAL ADVANCES AND POSSIBLE U.S. RESPONSES USING RESEARCH JOINT VENTURES

THURSDAY, JUNE 30, 1983

House of Representatives, Committee on Science and Technology, Subcommittee on Investigations and Oversight, and the Subcommittee on Science, Research and Technology,

Washington, D.C.

The subcommittees met, pursuant to call, at 9:30 a.m., in room 2325, Rayburn House Office Building, Hon. Doug Walgren (chairman of the Subcommittee on Science, Research and Technology) presiding.

Members present: Hon. Albert Gore, Jr., Hon. George Brown, Jr., Hon. Harold Volkmer, Hon. Claudine Schneider, Hon. Richard Durbin, and Hon. Tim Valentine.

Mr. Walgren. Let me call our hearing to order today and start off by turning to Congressman Gore for his opening statement and then we will hear from Congressman Ed Zschau from the Silicon Valley area and then our first panel.

Congressman Gore.

Mr. Gore. Thank you very much.

Today we continue hearings on Japanese joint research and U.S. responses. Yesterday we heard testimony describing the Japanese Government's role in promoting joint research and the importance of joint research to Japan's quest for technological preeminence. We also were reminded that many of Japan's technological successes can be traced to other factors such as a well-educated work force, a commitment to innovation and an enlighted approach to involving workers in the managerial decisionmaking process.

Finally, we heard about two major efforts in the U.S. electronics industry to promote technological innovation through research joint ventures.

During today's hearing, we will hear from present as well as former U.S. Government officials who will further detail the importance of research joint ventures and, also, suggest ways of promoting RJV's through the venture capital market. We will also hear testimony about a joint research effort that now exists within the chemical industry. Our concluding panel will discuss the legal difficulties in creating research joint ventures.

As I mentioned yesterday, there have been no decided cases brought to the attention of the subcommittees in which a research joint venture was found to violate the antitrust laws. Yet, those same laws are frequently cited as exerting a chilling effect on the formation of research joint ventures.

In most instances, the cost of defending against an antitrust suit and the fear of treble damages are stated to be the reason for the claimed chilling effect. Others have claimed that the primary obstacle to research joint ventures is a lack of willingness on the part of companies to share research. Today's witnesses will focus on these claims and on the various approaches that have been suggested to promote research joint ventures and to shelter research joint ventures from the effects of litigation.

While approaches vary, each, however, raises certain common issues. Among these is how can legislation be structured so as to promote RJV's but, at the same time, not build in the potential for practices that are adverse to the antitrust laws?

Many other technical questions also exist. Perhaps the most important is what precedential effect the sheltering of RJV's through piecemeal revision of the antitrust law will have on other aspects of the antitrust law? While these are issues that eventually will be resolved in a legislative format, such questions are, as we have seen, inextricably connected to the research issues which are the central concern of our two subcommittees.

Both subcommittees approach these issues with a great respect for the antitrust laws but also with an open mind.

We look forward to today's testimony. We welcome our witnesses and guests today and look forward to today's testimony

Mr. **Walgren**. Thank you, Mr. Gore.

On behalf of my subcommittee, I also want to extend a very direct welcome and express our appreciation for the time and understanding of the witnesses we have before us and we appreciate your participation very much.

At the outset, we would like to hear from Congressman Ed Zschau from California who has both a very personal background involved in this area and has maintained that interest in his legislative work.

We would be pleased to have your statement, Congressman Zschau. We would also be pleased to have you join us in any way on the panel if you have the time to join us. Welcome, and we appreciate your interest in this area.

STATEMENT OF HON. ED ZSCHAU, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. **Zschau**. Thank you very much, Mr. Chairman and members of the committee.

I want to begin by commending your subcommittees and you as the chairmen of those subcommittees for holding these hearings. I have found them to be the best hearings that I have seen in a long time on these very important issues. I think it is important to understand the competition that our high technology companies face and the government programs that their governments follow.

I think it is also important to solicit ideas for how the United States can maintain and extend our technological leadership and that appears to me to be the focus of these hearings and therefore they are right on target.

I would also like to thank you for the opportunity to appear briefly at this time and to work it into my schedule. It is very important for me to have a chance to talk on these subjects.

I am going to be brief. I am going to comment on three areas that your hearings have addressed recently.

No. 1, industrial policy; No. 2, the proper role of our Federal Government in high technology promotion; and, No. 3, I would like to comment on proposals for altering the antitrust laws to permit R&D joint ventures.

The question is often asked, do we need in the United States an industrial policy and the answer is of course we do. We need to have a recognition that Government actions affect business and those actions might be disparate actions and confusing and causing contradictions. An industrial policy, to my way of thinking, is merely a rational and coordinated set of Government actions to affect business. Rational in that we understand what we are trying to achieve and coordinated in that the pieces fit together to achieve that long-range purpose.

There are those that assume that once we have agreed that we need an industrial policy or should have one that that means central planning. Some sort of Government planning agency that would pick the winners and pick the losers and allocate resources to the winners.

We frequently call to mind the Japanese model at least as we envision it with the Ministry of International Trade and Industry somehow determining whether the Japanese economy should go and then rallying the Japanese companies around that strategy.

My personal feeling is that such central planning, if we tried to implement it here in the United States, would be doomed to failure. My colleagues who have participated in the investment business and the venture capital business have understood how difficult it is to pick winners from losers. Typical venture capital company when looking at new opportunities, new ideas figures that 1 or 2 successes out of 10 investments is about all one can plan on. But I do feel that we have to adopt some system of targeting. But rather than targeting on a particular set of industries or targeting on a set of technologies, targeting on products.

My feeling is that our industrial policy in the United States should be playing to our strengths in innovation, in developing new ideas and therefore our Government policy should target on the process of innovation. That is, we should be following Government actions that create an environment in which technological innovation can flourish and in which new ideas can flourish, a targeting policy to promote growth wherever it might occur, whatever the technologies of the industries might be.

In my district, as you mentioned, Mr. Chairman, there have been some developments in technology. Back in the late 1950's, William Shockley came from Bell Laboratories, set up Shockley Labs to exploit the new transistor invention and a group of engineers that formed around in his laboratory left that laboratory to start a new company that became Fairchild Semiconductor in the integrated circuit business. A group left that company and formed Intel which developed the first micro processor.

The technology evolved in that particular industry from the basic research idea to a series of industries. When one talks about targeting the process of innovation one has to look at, the history of innovations and determine what are the prerequisites, what is necessary in order for innovation to flourish and then make sure that our Government actions promote those prerequisites. I believe that there are four prerequisites to the process of innovation that our governmental actions should focus on.

We should be evaluating legislation to make sure we are both promoting these and avoiding setting up disincentives for them.

The four prerequisites are: No. 1, a commitment to basic research. We have to have the foundations for future products.

No. 2, incentives for the risk takers, the entrepreneurs, the investors, the innovators, the companies to do R&D because you don't get innovation risk free. There is risk involved in the development of all new ideas.

No. 3, we have to have an education system that provides enough trained technical people in order to develop those ideas. Currently in this country we are falling behind. We estimate that there will be a shortfall of about 80,000 engineers in the United States over the next 5 years unless our engineering departments at our colleges and universities are expanded and able to meet the demand.

No. 4, in order to have innovation you have to have ample opportunities, both domestic and foreign. That means a robust domestic economy and an aggressive international trade policy.

If we have a process of targeting technological innovation, it will focus on research, incentives, adequately trained technical people and the development of ample economic opportunities.

Let me deal specifically now with the antitrust law proposals that relate to R&D joint ventures.

This particular concept relates to the first two of those prerequisites, the need for a commitment to basic research and having ample incentives for the risk takers.

Currently, most of the research that is done in the United States of a fundamental nature, a very basic nature is sponsored by the Federal Government in universities. Typically companies do more applied research that they can justify based upon a return from the products that they sell. But as time goes on, even that applied research becomes more expensive, riskier.

When you are talking about developing a very high-speed integrated circuit or you are talking about developing a new kind of pharmaceutical product, you are talking about developing a fifth generation computer. You are talking about a very massive project with a lot of risk associated with it.

These projects, quite often, are too expensive and too risky for a single company to undertake. And the question is, What can we do in order to encourage that to remove some of the disincentives so that companies will take those risks?

One of the concepts is to allow companies to form research joint ventures to pool their research results so they can both afford to make the commitments financially and afford the risk that is required.

Unfortunately, even though the record for suits against such research joint venture is sparce, there is a concern that even if the

Justice Department felt that such research joint ventures were not competitive, private suits might be lodged because of the incentive of treble damages.

I think you have had testimony about the joint venture MCC in which the joint venture was given a pat on the back by the Justice Department but an individual attorney fired off a letter indicating that there was a possibility of a private suit.

There are two basic approaches in my opinion to deal with this. That is to reduce the risk of antitrust litigation in the case of bona fide R&D joint ventures.

One is the approach recommended in House Resolution 1952 of which I am a cosponsor. That particular approach is that each R&D joint venture would have to file with the Justice Department and also meet certain criteria having to do with the market share of the companies that are involved in it, having to do with its openness to all participants on an equal basis and having to do with the licensing of the technology that is developed after a period of time to any company that wants to get that technology.

The approach that I would use, that is used in 1952 is the concept of complete immunity for a qualified research joint venture. That is if it meets these specific standards or qualifications, then it would be immune from antitrust litigation.

The problem with that approach, the weakness of that approach is that those criteria may be too narrow. They may not be appropriate in some cases. It may not be satisfactory to the joint ventures to be required to license after 3 years the technology to another U.S. company, particularly when that U.S. company may be the U.S. subsidiary of a Japanese company. So that under 1952, if the requirement for licensing were kept in, our foreign competitors could, after a period of 3 years, obtain a licensing access to the technology.

There is another approach to mitigating the risk of antitrust suits in the case of research and development joint ventures and that is to restrict the grounds for suit, to restrict the remedies for suit. To restrict the kinds of actions that can be brought against an R&D joint venture so that the number of ways and the incentives for those ways to be implemented for suit would be reduced. That doesn't completely give immunity, but if you didn't require conditions to be met then there would be more flexibility for the joint venture to form.

Let me give you some examples.

Let's suppose that we remove from the antitrust law the notion that forming a research joint venture was a per se violation of antitrust law and merely said that a rule of reason would be the only grounds on which an antitrust suit could be brought.

No. 2, let's suppose that we said that there would be no private suits brought, that only the Justice Department would be in a position to bring antitrust action against the joint venture. Or perhaps we reduced the damages from treble damages to single damages to reduce the incentives for private suits. Or perhaps we reduce the kind of remedy to injunctive relief only. The notion here is to narrow the actions, to narrow the remedies to permit less incentive for bringing suit but, on the other hand, give greater flexibility to the kind of R&D joint ventures that would be brought to bear.

I have studied these two different approaches and my personal opinion that I would like to leave with the committee is that I think that we need, in order to promote R&D joint ventures on a broad scale, more flexibility in the formation of those joint ventures than is allowed for in 1952. I think that those criteria are too narrow. I think that the R&D joint ventures would form without complete certainty, and frankly I think we need to maintain safeguards against abuse.

My personal feeling is that if we eliminated R&D joint ventures as a per se violation of antitrust law and we limited remedies to injunctive relief only, that we would have a good balance between the flexibility that is necessary, that is not going to satisfy certain conditions under which the joint venture would be formed but merely limit the type of action and the remedies and the grounds on which the suit could be brought to rule of reason only and injunctive relief only.

Those are the comments that I had to make. I appreciate, Mr. Chairman, the opportunity to make them before your committee and I would be delighted to answer any questions that you or the other members might have at this time.

Mr. **Walgren**. Thank you very much for that comprehensive tour over the road map of this area. That is a good background for everyone that is interested in it.

Are there members who have questions or comments?

Mr. **Gore**. Mr. Chairman, I would just like to compliment our colleague on the work that he has done in this area. We look forward to working with you and your continuing effort to address these problems.

Mr. **Walgren**. Again, let me extend the invitation to come and engage in the discussion as the hearing goes along. We do really appreciate your interest in it and from the viewpoint of these two subcommittees, we would like to try to expand the participation in the whole Congress so that this issue might develop fully.

Mr. **Zschau**. Well, thank you very much, Mr. Chairman. I appreciate the invitation and I will do my best to participate in any way that I can that is instructive. Right now I am going to a meeting to meet with Admiral Inman on this very subject, but I hope to be able to assist your efforts in the future.

Mr. **Walgren**. Thank you very much for your testimony this morning.

With that, let's turn to the first panel and receive your statements in sequence and then have some opportunity for discussion.

The panel is made up of William F. Baxter, Assistant Attorney General for Antitrust for the U.S. Department of Justice; Ky Ewing, former Deputy Assistant Attorney General for Antitrust and now in the private practice of law; Dr. Bruce Merrifield, U.S. Department of Commerce, and Dr. Jordan Baruch, a consultant and former Assistant Secretary for Productivity Technology and Innovation with the Department of Commerce.

We are very pleased to have all of the gentlemen here. Your written statements will be made a part of the record, so please feel free to outline or summarize in communicating to the committee what you feel is most important.

Let's start with Mr. Baxter and go through in that sequence.

STATEMENT OF WILLIAM F. BAXTER ASSISTANT ATTORNEY GENERAL, ANTITRUST DIVISION, U.S. DEPARTMENT OF JUSTICE

Mr. **Baxter**. Thank you very much, Mr. Walgren. I am grateful to you and Congressman Gore for this opportunity to discuss these important subjects with the two subcommittees. As has already been indicated in your opening statement and that of Congress Zschau, there is no statutory prohibition against the formation of R&D joint ventures in the antitrust laws nor are there any cases that say they cannot be formed. Nevertheless, there is a widespread perception in the business community that there are serious antitrust risks and we are told again and again that they deter the formation of these ventures and it really doesn't matter whether that perception has a very sound legal base if the perception is present and I don't think there can be any doubt about that.

And accordingly, it seems to me important that we take legislative action in order to allay that perception and encourage the formation of these ventures where they are appropriate from a business and technological standpoint.

The bills that have been introduced, however, both in the House and in the Senate, seem to me too narrow in their focus.

It is not sufficient, in my view, to facilitate the creation of innovation, inventions, intellectual property of all kinds. It is necessary that there be a reward to those who engage in that creative process or the activities will not occur.

Unlike joint ventures there there is no explicit antitrust law that gets in the way, our antitrust laws for many, many years have been highly intrusive and seriously damaging to our systems of intellectual property. There is a welter of antitrust laws that interfere with the way patents and copyrights can be licensed and the licensing of trade secrets of various kinds and at least as important as eliminating the perceptual concerns about the legality of joint ventures is the repair of that antitrust damage.

R&D involves risks in a large fraction of research undertakings. There is no payoff at all. The odds are thousands to one in some industries such as the drug industry for every new chemical industry explored the odds are infinestimally small, about 60,000 to 1 that no useful product will ever emerge.

The research techniques themselves become more and more expensive but the most serious difficulty is that innovation consists essentially of knowledge and once one has created new knowledge, it can be copied and used by anyone. All its potential profitability to its creator can be drained away by free riders unless he is effectively protected in his exclusive right to use and to license that information. And it is that aspect of our intellectual patent laws, copyright laws that the antitrust laws have seriously damaged over the years.

And so, it is the fact that the bills currently pending that do not address this aspect of the problem at all that gives me concern.

The bills that are presently pending for the most part I also find needlessly regulatory. There is, in my view, no need to tell one of these joint ventures how its management board should be constructed or what sort of licensing policies it should engage in. All that is necessary is to guard against the competitive risks that are associated with R&D joint ventures. R&D joint ventures can be highly productive and procompetitive, but they can also be anticompetitive and the risks of anticompetitive joint venture structures are not adequately guarded against in the bills currently pending.

The Department of Justice, working together with the Commerce Department in recent weeks have worked out a broader approach that responds to the concerns I have described. That approach, which we hope to be able to bring up to the Congress fairly shortly in legislative form, has essentially five features. First, it would tell the courts that they are not to apply per se rules in the intellectual property area. Patent licensing, other forms of intellectual property exploitation, the formation of research joint ventures themselves, all would be governed by the rule of reason, so-called, rather than per se rules.

Second, there is an area of judicial doctrine or created law that is usually consumed under the heading of patent misuse, copyright misuse. Some of the rules that have developed in this area are perfectly sound but others are not sound. Highly fanciful theories that have no underlying competitive reality whatsoever, and the second feature of this package would tell the courts not to invoke misuse doctrines unless they make a finding that there is or is likely to be substantial competitive harm of some kind.

Third is a fairly technical change that affects process patents.

At the present time, if someone has a process patent in the United States someone can go to another country and use that process to make a product and then import the product into the United States and thereby completely undermine the value of the exclusive position that the process patent purports to confer and the third feature of this package would enable holders of process patents to block the importation of products made by the employment of his patented process.

The fourth feature addresses the joint venture problem that is centrally before us. It is the essence of simplicity, unlike the bills currently pending, it creates no new machinery. It does not call for certification and yet we think it is fully adequate. All that would be required is for the entities that wish to form a joint venture to file a detailed statement with the Attorney General describing the venture they plan to undertake, who the parties would be, the nature of the effort they plan to undertake and that simple act would confer on them immunity from all forms of antitrust liability save one, namely the ability of the Department of Justice to bring an injunction action.

We would study that. If we needed further facts we would use our existing CID authority to get them and we would not find it difficult within a period of 30 days or occasionally perhaps as long as 60 days to be in a position to be confident if there were any competitive risks present. If there were, we would simply go into court and ask for an injunction. We would be able to do that before any substantial investments had been made.

Implicitly, the existing antitrust rules clarified by the point that these things are always to be judged under a rule of reason and not by a per se rule would be the standards that governed. We would use the Federal district courts as we now do in all antitrust cases as our forum and no other apparatus would be necessary. That would give the business community the maximum amount of flexibility as to the formation of these ventures whether they were to be limited partnerships; as Dr. Merrifield suggests, the use of financing techniques or jointly owned profitmaking enterprises or such other forum as they might take.

It is my perception that that much shelter from the antitrust laws in particular present the private treble damage action which I think is the real threat here that deters formation of these units to the extent they are deterred is sufficient and I believe that the business community is in general agreement with that proposition.

Finally, in the fifth feature of this package, it would eliminate the treble damage feature of the antitrust laws from activities which were appropriately judged under the rule of reason. Treble damages would be retained with respect to all activities covered by per se rules, but in those areas where conduct is arguably legal, where it is right out on the table and there is no covertness, everyone can see what is going on, it is our judgment that the continued application of treble damage overdeters business conduct, chases people away from perfectly lawful activity because of the risk of an erroneous determination given the inescapable uncertainty that there is in the rule of reason area.

It is my judgment that the combination of those five features would restore the incentive system that our intellectual property laws were intended to create, would facilitate the formation of the joint ventures and would significantly improve and strengthen the productivity of our economy.

Thank you very much, gentlemen.

Mr. **Walgren**. Thank you very much, Mr. Baxter.

[The prepared statement of Mr. Baxter follows:]

U.S. Department of Justice

Washington, D.C. 20530

STATEMENT

OF

WILLIAM F. BAXTER
ASSISTANT ATTORNEY GENERAL
ANTITRUST DIVISION

BEFORE THE SUBCOMMITTEES ON

INVESTIGATIONS & OVERSIGHT
AND
SCIENCE, RESEARCH & TECHNOLOGY
OF THE
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

CONCERNING

RESEARCH JOINT VENTURES

ON

JUNE 30, 1983

Mr. Chairmen and members of the Subcommittees:

I want to thank you for the invitation to participate in this panel discussion to consider ways of promoting United States technological growth. I would like to focus my prepared statement on the need for legislation to improve the incentives for creating and developing new technologies.

The bills that have been introduced thus far dealing with joint research and development (R&D) activity by U.S. firms appear to respond to concerns that United States firms are somehow at a disadvantage when competing against foreign firms in international markets. The bills also recognize, at least implicitly, that the growth and improvement of technology are necessary to foster a strong and productive economy. While the Department of Justice strongly concurs that the stimulation of technological advance is vital to our economic well-being, we believe the approaches taken by those bills do not represent the most effective means of inducing innovation. They are too narrowly focused, create unnecessary regulatory burdens, and in some ways may inhibit, rather than stimulate, technological innovation. We believe a much broader approach will more effectively stimulate technological growth, and we have developed a comprehensive legislative package to that end.

A. A Legal Climate That Is Conducive to, and Stimulates Technological Advance Is Necessary to Foster Innovation and Productivity

It is extremely important that the United States have a legal and economic environment conducive to the creation and exploitation of new technologies. Most obviously, new technologies increase the variety of goods and services available to satisfy the demands of consumers. More importantly, new technologies often enable society to produce existing goods and services far more efficiently--that is, using fewer of society's resources. By lowering prices and increasing efficiency, advances in technology result in increased ouput, reduced inflationary pressures, and higher productivity. As a result, technological growth plays an important role in improving the well-being of consumers and in increasing the ability of United States industry to compete in international markets.

The creation of technology is an economically risky undertaking. There is no guarantee that research will uncover a promising technological concept. We all can recall numerous lucrative technological breakthroughs that have been successfully developed by R&D efforts. Much R&D, however, results in at most minor technological improvements that, although cumulatively important to improving our economy's efficiency, are individually only marginally profitable. The adverse effect that the risky nature of R&D has on the incentives to invest in the creation of new technology is exacerbated by the fact that the sophisticated R&D necessary today has become increasingly expensive.

Because the essence of technology is information and it generally is difficult to prevent others from duplicating information once it is created, even the creators of spectacular technological breakthroughs may be unable to earn a substantial return on their investment in R&D. "Free-riders" on, rather than creators of, the technology may be able to appropriate the bulk of the economic benefits that result from the technology. The exclusive property rights established by the various regimes of intellectual property are, in fact, designed to overcome this free-rider problem. Intellectual property rights have served our economy well by providing a market solution that provides inventors and innovators with rewards for their R&D efforts that reflect the benefits that their technological creations confer on society.

After a successful technology is created and provided with some form of intellectual property protection, the technology still must be commercially exploited before the inventor can earn his reward and society can realize the full benefits of that technology. Intellectual property also serves this end. It provides a legally defined "commodity" that can be transacted in the market. As a result, through contractual arrangements, the inventor can combine his intellectual property with the goods and services of others and thus bring the technology in a commercial form to the marketplace more quickly and at lower cost than otherwise would be possible.

Because of the importance of technological advance, it is crucial that the legal system is designed in such a way as to foster and not inhibit the growth of technology. The legal system therefore should be designed to minimize the economic and legal risks involved in the creation, protection and exploitation of new technology.

If properly drafted, legislation directed at encouraging R&D in the context of joint ventures can induce increases in technology. However, focusing solely on improvements in the legal climate that affect the creation of technology while ignoring improvements in the law that relate to the protection and exploitation of technology is unnecessarily narrow. After a careful review of the available alternatives, the Departments of Justice and Commerce have developed a package of five legislative proposals which deal with all phases of the innovation process and seek to improve significantly the climate for the growth of technology. While one of these proposals provides what we believe is the optimal solution to the antitrust risk faced by joint R&D ventures, the other four proposals go much further to increase the incentives for innovation.

B. A Five Part Legislative Package Will Significantly Increase the Incentives for Investment in R&D and for the Efficient Exploitation of New Technologies

The first part of the Administration's approach responds to the perception that the risk of antitrust treble damage liability inhibits the formation of procompetitive joint R&D ventures. The Department of Justice believes that the substantive antitrust standard itself is not hostile to joint R&D activity per se and condemns only anticompetitive R&D ventures. We recognize that there is some uncertainty under the antitrust laws as to whether a particular joint R&D venture will be found illegal. However, it is inevitable that some uncertainty will attend any economic analysis that is sufficiently flexible to distinguish procompetitive from anticompetitive activity in a myriad of factual circumstances. Even though the risk of an incorrect legal decision may be small, that risk is exacerbated by the length, complexity and cost of antitrust suits and the fact that a successful claimant under the antitrust laws is automatically entitled to three times the damages actually suffered. This risk may have deterred the formation of some procompetitive joint R&D ventures.

The Administration's approach to solving this problem would clarify that joint R&D may not be condemned as per se illegal under the antitrust laws. In addition, for joint R&D ventures that are fully disclosed to the government, the proposal would provide immunity from all private antitrust suits and from government antitrust damage suits. If a joint R&D venture proved to be anticompetitive, the government could still challenge it under the current antitrust standard. The Administration's approach thereby would eliminate any possibility that antitrust uncertainty might deter procompetitive joint venture activity, while retaining adequate safeguards against anticompetitive joint R&D activity.

Because the ability commercially to exploit technology once it is created is necessary to provide the optimal incentives for investment in R&D, it is not enough merely to reduce the antitrust risk surrounding joint R&D ventures. In addition, it is necessary to assure that the legal climate does not unnecessarily inhibit the efficient exploitation of technology. Three parts of this approach would amend the antitrust, patent and copyright laws to promote the efficient exploitation of technological innovations. One of these parts would eliminate mandatory treble damage liability under the antitrust laws for all practices that are not clearly and inherently anticompetitive. Another of these three parts would clarify that courts may not condemn intellectual property licensing arrangements as per se antitrust violations. The third part would preclude the courts from relying on the misuse doctrine to deny enforcement of patents or copyrights on competition grounds unless the conduct deemed to be misuse rises to the level of a violation under the antitrust laws.

Turning to the first of these three related parts, the threat of mandatory treble damages is a necessary and appropriate deterrent to conduct that is clearly anticompetitive and is carried out in secret, as in the case of price fixing among competitors. Such a punitive damage remedy is counterproductive, however, when it applies to conduct that can be procompetitive and is carried out in the open. Because treble damages greatly increase the cost associated with the risk that some court might incorrectly condemn a particular procompetitive practice, the remedy can inhibit a wide variety of procompetitive arrangements. The remedy has a particularly pernicious effect on the incentives to innovate because it tends to overdeter licensing of intellectual property, an activity that usually increases efficiency and thereby increase the returns to investments in R&D.

Our approach of prohibiting courts from condemning as per se illegal intellectual property licensing arrangements is similarly motivated. Courts would be required to consider the procompetitive benefits of a licensing arrangement before finding that it violates the antitrust laws. Such an amendment would inform the courts that intellectual property licensing arrangements generally enhance, rather than impede, innovation and productivity and that the antitrust laws must be sensitive to this fact.

The Administration's approach would change the patent and copyright doctrines of misuse for much the same reason. Currently, some courts employ the misuse doctrine to deprive an intellectual property owner of his exclusive rights on the basis of vague notions of what seemed "unfairly" anticompetitive to them, without engaging in the careful economic analysis that the antitrust laws should employ. As a result, the courts have effectively denied some inventors the fruits of their genius because those inventors engaged in conduct that upon close scrutiny is actually procompetitive. The Administration's proposal would prevent this possibility.

The final part of the Administration's five part proposal would improve the protection afforded to process patents. The current law contains a "loophole" that allows the unauthorized importation of products made outside this country by employment of the patented process. By providing an effective means to circumvent the exclusivity that the patent laws otherwise provide to a process patent holder, this loophole reduces the returns to owners of process patents and thereby diminishes the incentive to invest in efficiency-enhancing process innovations.

The Administration's approach represents a comprehensive solution to a problem that includes, but also extends beyond, the concern with joint R&D ventures. We strongly believe that nothing less than such a comprehensive approach is necessary to foster the optimal level of investment in technological innovation. Moreover, our approach toward joint R&D ventures avoids certain problems that would arise under the three joint R&D bills presently pending before this Committee.

C. The Approaches Taken in Bills Currently Pending Before Congress Raise Serious Problems That Are Not Present in the Approach Advocated by the Administration

The Administration developed its approach relating to joint R&D ventures after careful analysis of the benefits and detriments of the bills currently pending before Congress . Those bills appropriately seek to reduce the uncertainty that now surrounds the application of the antitrust laws to joint R&D ventures. While the bills go far towards achieving certainty, we believe that the modifications embodied in our approach would be an improvement over the approach taken in these bills. Our modifications are directed at two problems. First, certain of the bills would transform the Department of Justice from its traditional role as enforcer of the antitrust laws to a regulatory bureaucracy. Second, certain of the bills would replace the existing antitrust standard for distinguishing legal from illegal joint R&D ventures with standards that employ arbitrary, and at times anticompetitive, criteria. The Administration's approach would avoid these problems and at the same time would be as effective in eliminating the adverse deterrent effect that the antitrust laws currently may have on joint R&D activity.

Certain of the bills currently pending before Congress would require the Attorney General to certify that applicant joint R&D ventures satisfy the criteria established under the bills. In its role as certifier, the Department would be required to oversee the structure and conduct of all joint R&D ventures, regardless of their anticompetitive potential. This would unnecessarily interfere with numerous innocuous joint ventures. Furthermore, it would entail the expenditure of substantial Departmental resources that could be better spent investigating and prosecuting anticompetitive behavior. The Administration's approach rejects the certification route and instead would allow the Department to target its limited resources against joint R&D activities that the Department has reason to believe are anticompetitive.

Next, certain of the pending bills would abandon the antitrust analysis that traditionally has been employed to determine whether a particular joint R&D venture is anticompetitive. However, it is extremely difficult, if not impossible, to imagine statutory criteria that would be as effective as traditional antitrust analysis in differentiating procompetitive from anticompetitive joint R&D ventures. The bills would replace that traditional standard with an immunity based on certain wooden and largely irrelevant criteria.

A number of criteria used in the bills are inadequate to distinguish between procompetitive and anticompetitive joint R&D ventures. For example, in certain bills the market shares would always be calculated on the basis of worldwide sales of a product. While producers throughout the world can effectively compete in the United States for sales of certain products, foreign producers are often unable to compete in the United States because of transportation costs, protectionist barriers, or other reasons. Treating the markets for all goods as worldwide in scope, regardless of the competitive reality, is therefore arbitrary and could result in antitrust immunity for joint ventures that have significant anticompetitive effects.

Of even greater concern to the Department of Justice are those criteria in the bills that would actually encourage anticompetitive joint ventures and destroy existing incentives to innovate. Certain of the bills seem to be premised in part on the notion that it is necessarily procompetitive and beneficial to give all United States firms open access to joint ventures and to obligate joint ventures to license their discoveries to non-member United States competitors after a limited period of time. To the contrary, open access and mandatory licensing will impair rather than promote competition. The larger the percentage of market competitors participating in a venture, the greater the venture's anticompetitive potential. It is only under very rare economic conditions that the exclusion of competitors from a joint venture and its fruits becomes a concern.

The mandatory licensing provisions contained in the bills, moreover, would diminish existing incentives for innovation. As I explained earlier, the system of exclusive rights under the intellectual property laws provides the means by which inventors and innovators can obtain a financial reward for their R&D efforts and thereby establish a strong incentive to invest in R&D. The provision for mandatory licensing in the bills would be a de facto repeal of the intellectual property laws and would in the long run reduce the flow of private resources into R&D.

Furthermore, when firms know that they will have access to their competitors' successful R&D efforts, their own incentive to invest in R&D may be reduced significantly. They may choose instead to "free ride" on the efforts of other firms. While the ride would not be entirely "free" because of the required payment of a "reasonable" royalty, the competitors will be assured of access to the invention, and access is often critical.

Mr. Chairmen, that concludes my prepared remarks. I would be happy to answer any questions you or other members of the Subcommittees may have.

Mr. WALGREN. Let's turn to Mr. Ewing who has held the same responsibilities.

STATEMENT OF KY P. EWING, JR., PARTNER, VINSON & ELKINS, AND FORMER DEPUTY ASSISTANT ATTORNEY GENERAL, ANTITRUST DIVISION, U.S. DEPARTMENT OF JUSTICE

Mr. EWING. Thank you very much, Mr. Chairman. I really appreciate the opportunity of appearing before the subcommittees on this very important set of issues. I will try to summarize my longer testimony.

First, I think we must recognize that we today are in an exponentially technological age in which, in a very real sense, technologies rather than firms are the basic competitors.

Second, I think there is mounting evidence that our public policies as a whole do not provide adequate reward for those who invest in the creation and diffusion of new technologies.

Third, I think the Japanese experience can be instructive in ways that the committee perhaps has not yet focused on.

Little technology could be imported into Japan during the period of its original antimonopoly law, article VI of which provided too little protection for investments in technology; after a change in that law we witnessed what the First Secretary of the Japanese Embassy has described as the greatest technology transfer to one country in history. Japan's present emphasis through MITI is on technology-specific targets rather than industry-specific targets.

As Japan switches from utilization of foreign technology to the creation of its own, we may well have to switch from the simple utilization of our own to a world in which we, too, are required to import technology in order to see our industries remain competitive.

Beginning in 1976, two basic studies focused on the relationship of our antitrust laws and the incentives to technology creation and diffusion. One was by the National Research Council, resulting in publications by the National Academy of Sciences. The second was the Domestic Policy Review of Industrial Innovation carried on during President Carter's administraiton under the able guidance of Dr. Baruch. Both concluded that our antitrust laws do not impede but rather spur innovation and that joint research and development, if properly structured, is clearly legal. Both, however, also concluded that we need to reduce uncertainties perceived by our businessmen.

The Antitrust Division's 1980 publication of its Antitrust Guide Concerning Research Joint Ventures, plus the Business Review Procedures presently available at Justice and FTC, plus the wide distribution of the guide under the auspices of the Commerce Department and the Industrial Research Institute have, I think, educated businessmen that most research joint ventures are compatible with our antitrust rules. Nevertheless, grave uncertainties and hesitations exist among responsible businessmen, to which I will return in a moment.

The second outgrowth of these studies was that the Antitrust Division itself changed its own position on certain patent licensing arrangements that Mr. Baxter just discussed. Unfortunately, the courts have not kept pace with the Antitrust Division's position, even that expressed in the Carter administration, and grave uncertainties exist as to certain patent licensing arrangements that I think have great procompetitive potential.

In short, there is a well-founded hesitancy on the part of business to engage in joint research and development efforts that, if successful, may best be implemented by fairly complex licensing arrangements. The reason lies in the risk of costly litigation. With our treble damage bounty provisions, designed to encourage private attorneys general to supplement government enforcement of the Sherman Act, we stack the deck in favor of litigation without distinguishing between suits against covert horizontal price-fixing cartels and suits against open joint research and development efforts. Thus, the joint venture businessman today faces the risk of litigation because of a bias toward litigation in the system.

Also, he knows that an astute plaintiff will often charge him with per se violations in the hope of persuading a judge to use per se shortcuts to condemn his venture, rather than engaging in a rule of reason analysis that would sort out the ultimate balance between some restraining effects and other procompetitive benefits.

In my judgment, congressional action is needed—not to make basic changes in the fundamental Sherman and Clayton Act prohibitions, and not to grant exemptions to targeted industries—but to make five refinements in how the courts treat overt conduct that has the economic potential to be procompetitive. Four out of five of these refinements are the same as those proposed by Assistant Attorney General Baxter to you just now. I have one refinement that he has not included and he has one refinement as to which I have some questions.

The four on which we agree are:

One, statutorily require a rule of reason analysis, rather than permitting per se rules, on research and development joint ventures and on arrangements to create and transfer intellectual property;

Two, detreble rule of reason cases, thus permitting single damages only.

Three, statutorily require compensatory prejudgment interest on the single damages, thus making an injured defendant whole.

Four, amend the patent and copyright laws to eliminate outmoded "misuse" doctrines and to give protection to process patents.

The additional refinement I would add would be to award attorneys' fees and court costs to defendants who are successful in defending against a plaintiff's per se antitrust claims, at least in cases involving research and development joint ventures and in cases involving arrangements to create and transfer intellectual property.

The concept of this fifth refinement is already contained in most of the bills now pending in Congress. This fifth refinement seems to me a logical corollary of changing the incentives to litigate in rule of reason cases. If we want to change the incentives, it is not sufficient merely to legislate about an outcome of the suit. We must also deal with the incentives related to the plaintiff's initial claims, which are what control discovery and much of the burden of litigation.

Plaintiffs should be left free to allege covert per se offenses compensable with treble damages, but only if they are willing to risk having to pay the defendant's lawyers and court costs if the allegations are unfounded. This change alone will, in my judgment, significantly reduce the risk to businessmen of unfounded litigation.

Mr. **Baxter**. I have no difficulty with that one, Ky.

Mr. **Ewing**. Mr. Baxter just stated that he has no difficulty with that one.

Mr. **Baxter**. It is certainly not part of the package we had in mind, but I agree with this fifth point that Mr. Ewing has suggested.

Mr. **Ewing**. I am glad he did that before I get to my next point which is a slight disagreement with Mr. Baxter.

Mr. Baxter's final proposal is that, upon the simple filing with the Justice Department and the Federal Trade Commission of the details of a joint research and development venture, all damage provisions of our antitrust laws would cease to apply, leaving open challenges to the research and joint venture only by the Government or by a suit for injunction by private parties.

Earlier this week, BNA published a draft that was slightly different from that. Its draft would indicate that upon the simple filing with the Justice Department and the FTC, you would get immunity from any damage allegations whether by the Government or private plaintiff, but that private individuals would continue to have the right to bring injunctive relief actions in Federal court.

As I heard him this morning, Mr. Baxter was limiting relief solely to the Government having the right to bring such actions.

I have questions about that because it seems to me that we have the potential first of putting a tremendous burden on the Justice Department to monitor every single one of these that will be filed and any time you give American business a total immunity from damages, I think you are going to have a lot of filings. That is going to be a tremendous burden even if the Justice Department doesn't have to go through the regulatory analysis that the certification proposals would require.

Second, I wonder if it is wise in our system of Government to say to a company that is injured by actions of a joint research and development effort that it cannot go to court and seek single damages for what would at that point have been proved to be anticompetitive conduct judged by our normal traditional rule of reason antitrust analysis.

I question that because to the extent that the simple filing will produce anticompetitive results that injure a company prior to the Government being able to come in and get an injunction, you are going to have unrecompensed injury from truly anticompetitive conduct that I am sure both Mr. Baxter and I would agree is to be deterred and not fostered.

Consequently, I would urge that the Congress be cautious before it goes the final step of saying a simple filing with no certification analysis should be enough to grant an exemption.

Let me try to sum up very briefly, Mr. Chairman, by saying that in my judgment, the five substantive refinements that I have recommended and that I am pleased that Mr. Baxter agrees with are the ones needed in our antitrust rules. I do think a properly craft-ed certification exemption similar to the bills that have been adva[illegible] to now with a rule of reason analysis in advance by the Jus[illegible]partment would probably do us no harm and could possibly be advantageous in some situations although I would strongly urge that it be recognized that this is a regulatory-type solution with considerable administrative burdens.

I am, finally, less sure that we should allow a system in which simple notification to Justice and the FTC can preclude injured parties from obtaining actual damages for violation of substantive antitrust norms under a traditional rule of reason analysis. Thus, I would urge caution in going beyond detrebling at this time.

Mr. Chairman, as a firm believer in our system of competition and in vigorous enforcement of the antitrust laws, I nevertheless believe that some legislative refinements are required in our antitrust enforcement system to reflect the rapidly increasing competititon of technologies.

Thank you very much.

Mr. WALGREN. Thank you very much, Mr. Ewing. I appreciate that.

[The biographical sketch and prepared statement of Mr. Ewing follow:]

Ky P. Ewing, Jr.

Partner:	Vinson & Elkins 1101 Connecticut Avenue, N.W. Washington, D.C. 202/862-6580
Former:	Deputy Assistant Attorney General, Antitrust Division U.S. Department of Justice
Born:	Victoria, Texas 1935
Education:	Harvard Law School, LL.B. 1959 Baylor University, B.A. 1956
Author of:	Various articles on the antitrust aspects of joint ventures, patent licensing and technology transfers; supervising author of the Antitrust Division's "Antitrust Guide Concerning Research Joint Ventures" (1980).

TESTIMONY OF

KY P. EWING, JR. */

Mr. Chairman, Members of the Subcommittees:

I appreciate this opportunity to testify, at the invitation of the Subcommittee on Investigations and Oversight, and the Subcommittee on Science, Research and Technology, about issues of competition policy and technology in the context of world-wide competition, particularly from Japanese firms.

The views I express today are strictly my own and should not be attributed to my law firm or to any client. They reflect several years of my own thinking on these issues, intensified while I was with the Justice Department's Antitrust Division, where I supervised the writing of the Antitrust Division's Antitrust Guide Concerning Research Joint Ventures (1980).

The Subcommittees are to be complimented for taking a fact-finding approach to the problems now faced by United States industries. When, as now, the United States no longer has the world's highest standard of living (measured

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*/ Partner, Vinson & Elkins, Washington, D.C. Former Deputy Assistant Attorney General, Antitrust Division, U.S. Department of Justice.

by gross national product per capita), when we seem to have lost to other countries the comparative advantage in many industries where our firms' technologies dominated for half a century, when our trade balances are negative, and when our economy is suffering a fairly severe recession, the temptations are to retreat to a simplistic protectionism and to abandon the fundamental competition rules that underlie our free-trade economy. Facts will help avoid those temptations, succumbing to which seldom works in the short-run and always hampers our economy in the medium- and long-run.

I. FOUR OBSERVATIONS ABOUT ISSUES OF COMPETITION POLICY AND TECHNOLOGY

Observations based on history will, I hope, be useful to the Subcommittees.

-- American Has Historically Opted for Competition

First, from earliest times this country has opted for a free-market economy, even when other countries were pursuing very different systems. In 1641, the very first code of laws drafted on the North American continent declared in Article IX: "No monopolies shall be granted or allowed amongst us, but of such new Inventions profitable to the Countrie, and that for a short time." */ In that year

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*/ Massachusetts "Body of Liberties," reprinted in American Historical Documents (The Harvard Classics) 66 at 68 (P.F. Collier & Son, 1938).

Iemitsu had just become the second Tokagawa Shogun of Japan, and is supposed to have confirmed the sale of salt as a monopoly of his shogunate; salt remains a Japanese Government monopoly to this day. In France, in that same era, King Louis XIII and his Minister Cardinal Richelieu responded to the technological innovation of calico export from the Indian subcontinent by banning its importation into France upon pain of death, and went on to regulate the number of threads per square inch that French weavers could use, targeting some cities to produce a finer weave than others. Our forebears in Massachusetts opted for a different course -- competition, with recognition "for a short time" of exclusive rights to useful inventions.

-- Technologies are the Basic Competitors In the Modern Economy

A second observation is one first emphasized in our time by the economist Joseph Schumpeter -- namely, that technologies, to a greater degree than firms, are the true competitors in the modern economy. Our laws, of course, must focus on firms. Certainly the Sherman and Clayton Acts focus on firms. The year 1890 saw not only the passage of the Sherman Act, but also the publication of Alfred Marshall's Principles of Economics, which, as Professor Kenneth Galbraith has observed, dominated economic analysis for 50 years, based on a static model of firm behavior in an economy in which technology was assumed to be already widely diffused and true innovative revolution seldom if ever occurred. It was not, even then, an accurate model, yet it was for decades the "current thinking" underpinning many of the legal opinions interpreting the Sherman and Clayton Acts.

Certainly today we know that we are in an exponentially innovative age, in which technologies overtake other technologies with ever increasing rapidity. Because of the exponential nature of knowledge, the very rate of technological change is rapidly increasing. This means that we must make sure our competition policy analyses keep pace. It makes no sense to worry excessively about firms' market shares in the X industry if a new technology possessed by different firms is about to create industry Y that will make obsolete the technology used by (and products of) all firms in industry X. Yet, the rapidity of technological innovation -- and the inability of governments, whether the ancient Kings of France or our present President, to stem its ultimate flow across national borders -- means also that we must make doubly sure to prohibit firms from engaging in cartel behavior that is designed to stifle technological innovation. We must, to use my prior example, make sure that the firms in industry X do not collusively kill or delay substantially the innovation that will produce industry Y.

-- Incentives to Technological Innovation Should be Increased

A third observation is that we must become much more concerned about the incentives to innovation that we, as a nation, give to our firms. Two elements are involved: incentives to create useful new technology and incentives for its rapid diffusion. There is, in my view, mounting evidence that our public policies (including our tax laws, patent and trade-secret laws, accounting rules, and our antitrust rules on technology transfer) do not collectively produce enough incentives for the creation and diffusion of technological innovations. For a fuller discussion of this point, may I respectfully refer the Subcommittees to an earlier paper of mine just published as Chapter 2 in _Antitrust, Technology Transfers and Joint Ventures In International Trade_, (Mathew Bender, 1983), which is a compendium of articles presented at the 1982 Fordham University Corporate Law Institute. The essence of the point is illustrated by Mansfield's study of 17 industrial innovations. While cautioning that "very little is known about the social and private returns from industrial research and technological innovation," his group concluded:

> _first_, "that the social rate of return from the investments in these seventeen innovations has been very high [about 56%],"
> _second_, "that the private rates of return from the investments in these innovations have been much lower [about 25%] than the social rates of return," and,
> _third_, "that, in about 30 percent of the cases, the private rate of return was so low that no firm, with the advantage of hindsight, would have

> invested in the innovation, but the social rate of return from the innovation was so high that, from society's point of view, the investment was well worthwhile." */

If Mansfield's conclusions are accurate for our economy as a whole, we must engage in considerable rethinking about rewards for those firms which innovate, and about means to share the risks of pre-innovation research and development efforts.

-- Some Lessons From The Japanese Experience

My fourth observation concerns the Japanese experience. Mr. Akinori Uesugi, First Secretary of the Japanese Embassy, in a private paper presented to the 1982 Fordham University Corporate Law Institute, noted that Article 6 of Japan's original Antimonopoly Act (promulgated by our occupying authorities) had rigidly "prohibited Japanese firms from concluding international agreements or contracts which restrict the exchange of scientific or technological knowledge or information." Mr. Uesugi quoted approvingly from Professor

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*/ Mansfield, "Social and Private Rates of Return From Industrial Innovations," 91 Q.J. Econ. 221, 239 (1977). See also Berg and Friedman, "Impacts of Domestic Joint Ventures on Industrial Rates of Return: A Pooled Cross-Section Analysis, 1964-1975," 63 Rev. Econ. & Statistics 293 (1981); Hlavacek and Thompson, "The Joint Venture Approach to Technology Utilization," 23 IEEE Transactions on Engineering Mgmt. 35 (Feb. 1976); Nelson and Winter, "The Schumpeterian Tradeoff Revisited," 72 Am. Econ. Rev. 114, 121, 131 (1982); and Berg, Duncan and Friedman, Joint Venture Strategies and Corporate Innovation, (Oelgeschaler, Gunn & Hain, 1982) (analyzing 650 joint ventures engaged in by some 950 firms between 1965 and 1973).

Chalmers Johnson that "By far the most serious problem with the original Antimonopoly Law was its ban on agreements that provided for the exclusive use of technologies or know-how . . . which stopped in their tracks all Japanese efforts to import technology."

Only after the end of the occupation and the liberalization of Article 6 in 1968 to permit greater rewards by a firm investing in technology did technology flows into Japan increase significantly. Mr. Uesugi observes as to the result:

> The importance of technology transfer to economic development can hardly be ignored. One of the salient features of Japan's economic success can be found in its relatively easy access to advanced technology. Japanese firms have reportedly spent more than 10 billion dollars in fees and royalties for foreign technology over the past 30 years. Altogether, nearly 22,000 international licensing agreements (including those for amendment) were filed with the Japanese Fair Trade Commission (JFTC) between 1947 and 1980. This seems to be the most significant transfer of technology to a single country in history. */

The Members of this Subcommittee are already aware of the Japanese Government's efforts over the years through its Ministry of International Trade and Industry (MITI) to help organize and aid industrial sectors, with strong participation by the 13 major Japanese city banks, the loan portfolios of which were in turn heavily influenced by official Bank of Japan policy on credit targets. This, coupled with stringent restrictions on foreign investment in Japan, and high marketing barriers, constituted a remarkable system of government-industry cooperation to re-create a strong industrial base, with Japanese firms often sharing cooperatively the risks of technology creation and developmental application.

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*/ Mr. Uesugi's paper, "Transfer of Technology and Joint Ventures in Japan" provides a good overview, including appendices on the Japanese Antimonopoly Act Guidelines for International Licensing Agreements, and statistics on such agreements by country and industry. It is printed as Chapter 13 in Antitrust, Technology Transfers and Joint Ventures in International Trade, (Mathew Bender), 1983).

More recently, as has been pointed out to the Congress by the General Accounting Office, Japan's emphasis has turned from industry-specific to technology-specific targets. Permit me briefly to quote from the recent testimony of Allan J. Mendelowitz, Associate Director of GAO's International Division (delivered to the House Ways and Means Subcommittee on Trade, April 11, 1983):

> The emphasis of industrial policy today has shifted from industry-specific to technology-specific targets; industries are assisted in developing and diffusing technologies throughout the economy that contribute to achieving the goals of higher value added production, greater productivity, and resource conservation. Industries such as computers, robotics, and aircraft meet these criteria and benefit from government support.
>
> Financial support for joint government-industry research and development programs is a major tool of government assistance for technology development, while tax incentives and special leasing programs are used to promote technology diffusion. These mechanisms work through incentive rather

> than control and, as a result, the government has less direct influence over industrial development than it had during earlier periods. Significant obstacles hamper the success of government policies in each growth industry we reviewed. Development of leading-edge computer technologies presents new risks for the government and computer companies. Problems encountered today in developing new technologies are different than those of licensing, adapting, and commercializing foreign technologies, which were successfully overcome during the last two decades.

We Americans need to remember this point about the difference between creating new technologies and utilizing imported ones. We also must recognize a different point -- that we, too, may need to import technology in the future if our firms are to remain competitive.

II. AMERICAN ANTITRUST LAWS ARE BASICALLY SOUND, AND PERMIT MOST JOINT RESEARCH AND DEVELOPMENT EFFORTS, BUT THEY NEED FIVE LEGISLATIVE REFINEMENTS.

In responding to the technological and competitive challenges in the next few decades, including those posed by Japan, American firms may well need to engage not only in far greater research and development efforts, but also in cooperative research -- in joint ventures in R & D.

-- Previous Studies Concluded That The Antitrust Laws Are Basically Sound

Beginning in about 1976, several studies were undertaken on American productivity issues, with the questions repeatedly being asked as to whether our antitrust laws impede innovation and whether joint research and development is legal. Both of the major studies concluded that our basic antitrust rules foster technological innovation and permit most useful joint research. */ Both also emphasized the need to clarify antitrust rules for joint research ventures and to convey that clarification to industry, in order to ameliorate the strong uncertainties expressed by businessmen. **/

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*/ Beginning in 1976 the National Research Council's Committee on Technology and International Trade Issues studied a number of technological issues and their relationship to the potential entrepreneurial vitality of the U.S. economy. These resulted in the 1980 publication by the National Academy of Sciences of a series of monographs, including one on Antitrust, Uncertainty and Technological Innovation.

During President Carter's Administration, an extensive Domestic Policy Review of Industrial Innovation was undertaken. It found that "by spurring competition, antitrust policies can provide a stimulant to the development of innovations."

**/ The Domestic Policy Review of Industrial Innovation, while noting that "vigorous enforcement of antitrust laws spurs competition -- and the pressure of competition is a stimulant to the development of innovations that provide a competitive edge," also directed the Justice Department to clarify its position on cooperation among firms in research to make certain the antitrust laws are not "mistakenly understood to prevent cooperative activity, even in circumstances where it would foster innovation without harming competition."

Antitrust, Uncertainty and Technological Innovation made seven recommendations in 1980: (1) more study of the relationship of market structures to innovation; (2) more study of the relationship of corporate diversification (conglomeration) and innovation; (3) caution by Congress in considering de-concentration legislation [proposals to limit conglomerate mergers being then pending]; (4) abandonment by the FTC of its titanium dioxide case against DuPont [which has since been abandoned]; (5) clarification by the Justice Department of its position that it will take into favorable account a merging firm's enhanced prospects for technological innovation; (6) clarification by the Justice Department of its position on cooperative research and development; and (7) administration of the antitrust laws in a manner consistent with the patent laws, to foster technological innovation.

-- Uncertainties Still Exist, Despite Previous Justice Department Clarification

As an outgrowth of those studies, and in response to a Presidential directive, the Antitrust Division published in 1980 its Antitrust Guide Concerning Research Joint Ventures. The Commerce Department and the Industrial Research Institute gave it widespread distribution among American businessmen. Its thesis is straightforward: if properly structured, most research joint ventures are compatible with out antitrust rules. And the Business Review procedures of the Justice Department and the Federal Trade Commission are available to assist business with prospective ventures, even though they are not binding on the government. In my opinion, that message of the Antitrust Guide is being effectively communicated to American businessmen and their attorneys. Yet grave uncertainties nevertheless remain in the minds of responsible businessmen about the antitrust litigation risks of joint ventures in research and development, and in technology sharing. To these uncertainties I will return in a moment.

A second outgrowth of those studies on productivity was the Antitrust Division's review of its own positions on patent licensing. Beginning in the Sixties and continuing until 1977, the Antitrust Division advocated stringently restricted, *per se* patent licensing rules that became known as the Nine No No's. In 1979, the Division publicly backed away from claiming that the Nine No No's were *per se* antitrust offenses. */ The present Administration has gone so far as to publicly "bury" each of the Nine No No's. **/

Yet in the patent licensing area, too, uncertainties still abound, because the courts have not taken consistent positions, and doctrines of patent "misuse" still make illegal what the enlightened view of the antitrust laws would declare permissible. Again, for a more detailed presentation of the problem, I respectfully refer the Subcommittee to my earlier paper to the Fordham Corporate Law Institute. ***/ Let me here cite only one example. The U.S. Court of Appeals for the District of Columbia Circuit in 1981 decided in *United States v. Studiengesellschaft Kohle, m.b.H.*, 670 F.2d 1122, that a patentee of a process can control the sale of unpatented products resulting from that process. Yet the same court a year before, in *Robintech v. Chemidus Wavin, Ltd.*, 628 F.2d 142 (D.C. Cir. 1980), held an export limitation on the sale of an unpatented product of a patented process to be patent misuse. The court has not reconciled these decisions.

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*/ Ewing, "Antitrust Enforcement and the Patent Laws," (May 5, 1979), reprinted in *Patent-Antitrust-Antitrust-Division Enforcement*, 5 Trade Reg. Rep. (CCH) ¶ 50,398 (1979).

**/ Lipsky, "Current Antitrust Division Views on Patent Licensing Practices," 50 Antitrust L.J. 515 (1981).

***/ *Antitrust, Technology Transfers and Joint Ventures in International Trade*, (Mathew Bender, 1983) pp. 28-32.

Let me turn for a moment to the nature of these uncertainties.

If a cooperative research and development venture, structured in accordance with the principles of the Antitrust Guide Concerning Research Joint Ventures is, on balance, pro-competitive, why should businessmen be deterred by antitrust fears? The answer lies in the risk of costly litigation. At present, in order to encourage private attorneys general to supplement Sherman Act enforcement by the government, we provide a treble-damage bounty. */ This stacking of the deck, as it were, in favor of litigation does not now distinguish between a suit against a covert horizontal price-fixing cartel and an open joint research-and-development effort that leaves marketing of the resulting innovative products up to the individual (and unilateral) efforts of each participant. Thus, the joint venture businessman today faces the risks of litigation, because of a bias toward it in the system. Also, that same businessman, if advised by sophisticated antitrust lawyers, must also appreciate that an astute plaintiff may well charge him with *per se* violations, in the hope of persuading a judge to use per se labels to condemn his venture, rather than engaging in a rule-of-reason analysis that would sort out the ultimate balance between some restraining effects and other pro-competitive effects.

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*/ In recent years, between 1,000 and 1,500 antitrust cases have been filed each year in federal court. On the average, the Justice Department files only 75 to 150 cases per year. Also, on the average, there are probably less than 200 to 250 antitrust cases per year in which a plaintiff recovers. A study of this by the Justice Department would be useful.

Moreover, that businessman must be advised that his licensing provisions for successful innovation (and also for pooling of current technological knowledge of the venture participants) will be subject to conflicting court decisions, with per se violation labels only recently removed by the Justice Department (and not necessarily by the courts) on many arrangements that can be procompetitive.

In summary, there are considerable business uncertainties about the antitrust treatment of joint research and development ventures, despite the best effort of the Justice Department to be clear about antitrust principles. Those of us most devoted to vigorous antitrust enforcement simply must face that reality.

-- Legislative Action Is Needed To Make Five Refinements

In my judgment, Congressional action is needed -- not to make basic changes in the fundamental Sherman and Clayton Act prohibitions, and not to grant "exemptions" to targeted industries -- but to make five refinements in how the courts treat overt conduct that has the economic potential to be pro-competitive. These refinements are:

1) Statutorily require a rule-of-reason analysis (rather than permitting per se rules) on research and development joint ventures and on arrangements to create and transfer intellectual property.
2) De-treble rule-of-reason cases (i.e., permit single-damages only in such cases).
3) Statutorily require compensatory pre-judgment interest on the single-damages (thus making the injured defendant whole).
4) Amend the patent and copyright laws to eliminate outmoded "abuse" doctrines and to give protection to process patents.
5) Award attorneys' fees and court costs to defendants who are successful in defending against a plaintiff's per se antitrust claims, at least in cases involving research and development joint ventures and in cases involving arrangements to create and transfer intellectual property.

As the Members of this Subcommittee are aware, Assistant Attorney General William Baxter recently circulated among Members of Congress specific language proposals and justifications for the first four of the five refinements I have listed above. I support his concepts and, if the statutory language I have seen continues as the Administration's proposal, I also support the statutory language changes as well, because I consider them well drafted. Consequently, I will not spend additional time in my testimony on the first four refinements.

The fifth refinement -- to award a successful defendant attorneys' fees and court costs in defending against a plaintiff's per se claims -- seems to me a logical corollary of changing the incentives to litigate in rule-of-reason cases, at least in those involving joint research and development and in those involving arrangements for the creation or transfer of intellectual property. If we want to correct the now over-balanced bias toward litigation, it is not, in my judgment, sufficient merely to legislate an outcome of the suit. We must also deal with the incentives related to the plaintiff's initial claims, which are what control discovery and much of the burden of litigation. Plaintiffs should be left free to allege covert per se offenses compensable with treble-damages, but only if they are willing to risk having to pay the defendants' lawyers and court costs if the allegations are unfounded. This change alone will, in my judgment, significantly reduce the risks to businessmen of unfounded litigation. I urge the Congress seriously to consider this refinement, as well as the four others also being advocated by the Justice Department.

If these five refinements are enacted by Congress, I believe that the antitrust rules operating in the arena of technological change will better serve our ultimate goal of protecting our system of competition which has so ably served the consumer welfare of this nation.

III. AN EVALUATION OF TWO LEGISLATIVE APPROACHES: SUBSTANTIVE LAW REFINEMENT OR CERTIFICATION/EXEMPTION

Finally, let me briefly turn to a comparison of the two basic legislative approaches now before the Congress, designed to deal with business uncertainties in the research and development area. One, outlined above, would effect changes in the substantive antitrust laws. The other would create a certification procedure by which the Justice Department could, in effect, exempt a joint research and development venture from the operation of unchanged antitrust rules (until the Justice Department itself obtained a court revocation of the immunity it had granted). This second approach is reflected in several bills:

H.R. 108 (Edwards, Hyde, Mineta);

H.R. 1952 (Synar, Gephardt, Wyden, Zschau);

S. 568 (Tsongas);

S. 737 (Mathias, Hart, Specter, Bascus, Chafee, Wilson, Cohen);

S. 1383 (Glenn, Kennedy).

While there are significant differences in their wording, the merits of which I do not address, the essential feature of each bill is a Justice Department certification system that results in an antitrust immunity or "exemption" from the ordinary workings of our antitrust rules.

It should be noted that such a legislative change is not mutually exclusive with the five substantive law refinements I have advocated above. Indeed, if the intent is for Justice Department certification to stick fairly closely with existing case law (*i.e.*, the intent is not to put the Attorney General into the exemption-granting business), then the recommended substantive refinements may be needed to make the certification process truly meaningful.

Clearly, a certification/exemption approach would provide for a lessening of litigation risks growing out of corporate actions that are certified. It would also have the advantage of transparency -- the government, at least, would be notified of what was going on.

On the other hand, if widely employed, the certification approach would result in a heavy, regulatory workload for the Justice Department, which basically consists of prosecutors somewhat ill-fitted to be regulators. I fear, on the basis of having been in the Division, that the very proper bureaucratic bias will be toward extremely conservative, cautious certification. It is the prospective, future immunity over activities and possible effects they really cannot foresee that will cause Justice officials to draw back.

Also, whichever of the certification bills might be enacted, the structuring of joint ventures that can be certified will be limited to that of the statutory scheme, even though other forms of organization or licensing of output might be more pro-competitive and better business.

Moreover, because the future is always somewhat different from what the businessman can now describe, not even a certificate of review can prevent litigation challenging a joint venture's activities at the fringes of the conduct described in the certificate. That, in my judgement, is a real risk that must be borne in mind if we are truly to deal with uncertainties.

The certification approach, at least in the bills introduced thus far, also fails to address the issues noted above related to outmoded patent and copyright "misuse" doctrines, and with issues of technology transfer from single-entities.

Finally, to the extent certification is of an activity that would not meet substantive antitrust standards for pro-competitiveness under a rule-of-reason analysis, then we would be encouraging anticompetitive conduct. (I assume that the Congressional intent behind all of the certification bills is to avoid any such anticompetitive result.)

The other approach -- five refinements in the substantive antitrust rules -- would admittedly leave the businessman with some risk of litigation (but probably not much more than the risk of litigation around the "fringes" of a certificate). Also, on matters that are litigated, the courts and the parties would have the burden of a rule-of-reason case, without per se short-cuts. Finally, some small risk of anticompetitive conduct slipping through is, of course, always present when there are changes in the antitrust laws.

But consider the advantages: the five proposed refinements in substantive law would deal directly with the heart of the problem, which is unfounded litigation -- making it less attractive, more expensive, and thus less common. The five refinements would leave in place the substantive objective of conduct that is, on balance, pro-competitive, while avoiding per se labels that can condemn pro-competitive conduct under the guise of short-cutting a full rule-of-reason analysis. Forms of cooperative conduct would not be limited to those specified in a statutory certification procedure. And roadblocks in the patent and copyright areas would be removed, so as to permit recovery of appropriate rewards for innovative outlays, thus enhancing technology creation and diffusion.

In sum, my judgment is that the five recommended substantive refinements are needed in our antitrust rules, but that a properly constructed certification/immunization approach with real analysis in advance by the Justice Department (if coupled with the recommended substantive changes) would probably do no harm and possibly be advantageous in some situations, although it should be recognized as a regulatory-type solution with considerable administrative burdens.

I appreciate the opportunity of appearing before these Subcommittees, and hope that my testimony will be useful to you as you go about the vastly important task of evaluating America's capability to respond to the technological challenges of our time, exemplified by those posed by our Japanese trading partners. As a firm believer in our system of competition, with vigorous antitrust enforcement to prohibit unreasonable private restraints of trade, I nevertheless believe that some refinements are required in our antitrust enforcement system to reflect the rapidly increasing competition of technologies.

Thank you.

Mr. WALGREN. Let's turn to Dr. Merrifield.

STATEMENT OF DR. D. BRUCE MERRIFIELD, ASSISTANT SECRETARY OF COMMERCE FOR PRODUCTIVITY, TECHNOLOGY, AND INNOVATION, U.S. DEPARTMENT OF COMMERCE

Dr. MERRIFIELD. Honorable Chairmen and members of the committees, thank you for this opportunity to discuss my views on joint research concerns, particularly as they relate to the antitrust laws.

I want to state right away we need to change our antitrust laws to encourage more joint research and development.

Joint research and development programs can be pro-competitive. They reduce duplication, promote the efficient use of scarce technical personnel, and help to achieve desirable economies of scale. Small firms are able to collaborate in joint research and development projects, which because of prohibitive costs, they could not do by themselves. For all of these reasons, joint research efforts are key factors in the ability of countries to stay competitive in the international marketplace.

Our major trading partners have focused collaborative efforts on research and development in high technology industries. These countries and the European Economic Community have been able to target for intensive joint research and development certain high tech industries, where the United States has a technological lead. As a result, our foreign competitors have been able to narrow the gap or to achieve preeminence in many of these industries.

Of greater significance to us currently is that Japanese antitrust law did not prohibit firms from conducting collaborative research and development in MITI targeted areas such as computers, microelectronics, electronic instruments, lasers, optical communication, robots, and aerospace. Earlier this year Mr. Kuzuhero Fuchi, Director of Japan's Institute for New Generation Computer Technology NGCT—announced a 10-year collaborative joint research and development venture with industry to create a so-called fifth generation computer. With this program, the Japanese hope to leapfrog the U.S. computer industry.

Similarly, French antitrust law did not deter French firms from conducting massive joint research and development projects in such areas as aerospace, telecommunications, microelectronics, energy and conservation equipment. West German firms also have not been inhibited by antitrust restrictions in conducting joint research and development in computers, microelectronics, and electronic office equipment.

The European Economic Community has exempted several collaborative joint research agreements of individual member countries from the antitrust restrictions of article 85 of its treaty. For example, the European consortium Airbus Industry led by France and West Germany has been able to conduct joint design, testing, and manufacturing, which assisted them in capturing roughly a quarter of the jet aircraft market in 1981. Prior to that, joint research and development has been authorized in such areas as nuclear oxide fuels and electronic components.

So much for the state of cooperative effort in other countries. Why is it important and what is its status of cooperative work in the United States? Let me review briefly by talking about something I call the innovation process pipeline.

I have put a chart up over here on your left to try to illustrate that.

In our effort to address this issue and devise effective policy solutions, it is useful to think of the process of technological innovation as a pipeline. This highlights the fact that technological innovation is a continuous process, and not a discrete event.

In general, innovation can be considered to have two major stages. The first stage is the invention itself. The second is translating that invention into a useful commercial product or process. The large majority of the cost, the risk, and the time is associated with the second stage.

We have grossly underfunded and underincentivized that stage.

It is commonly understood that in major industries, it takes 7 to 10 years to produce a significant new product or process to move through this pipeline. Perhaps 1 of 20 projects that starts out in the laboratory ever produces a positive cash flow. Innovation, therefore, entails high levels of risk, and if the national interest requires that the United States maintain world technological leadership, then it is also important to remove barriers to innovation and to provide appropriate incentives to undertake risks.

In 1984, we will put about $6.6 billion of basic R&D into that first box there (the invention step). We have about $3 or $4 billion of R&D that goes into that. We have the advanced technologies in almost every area of industrial interest. We have the advanced technology but we don't translate it effectively into commercial products. As a matter of fact, the European and Japanese countries, in a sense, cherry pick our technology, do subsidize it through the commerce level. An example, of course, is the ceramic engine which the Japanese have developed based on our heat shield technology developed in our space program.

Without adequate incentives, much of the basic R&D that is done in the United States will never be translated into useful products or processes. For the pipeline to work properly, we need to remove barriers to collaborative effort and provide incentives to cooperate which will minimize risk. Also needed, of course, as I mentioned in the context of our maintaining international competitiveness, is an adequate supply of scientists and engineers; access to capital for R&D and machinery; sound management; access to critical information; and a stable economic environment that is conducive to business decisionmaking.

Our own review of this innovation process has led Commerce to conclude that Government policies and programs exert a major influence, including effects on the direction and rate of technical development. For example, influential factors include Government procurement policies, R&D support, patent policy, antitrust and tax laws, education initiatives, and so forth.

Let me talk first about the need for incentives for R&D. Two examples of recent Government actions designed to strengthen this innovation process are:

The provision of about $6.6 billion of Federal funds in fiscal year 1984 for basic R&D, including an 18 percent increase in programs of the National Science Foundation, and new initiatives in the Department of Energy and NASA;

The Economic Recovery Tax Act which removed tax disincentives primarily for investment in plant and equipment.

Going back to my chart for a moment, let me tell you about the industrial technology partnership program that we have developed at Commerce to aid in generating more research and develolpment limited partnerships. It is largely limited to the tail end of that process. Venture capital will venture money only in things that are visibly operating and within a short time of commercialization. Therefore, it does not reach very far back into the pipeline. Therefore, there is a major gap there where we are underfunded, and where our foreign countries are utilizing our basic technology where we are not able to do that.

In fact, we tend to be fueling much of the development work that is going on around the world.

Under this new Department of Commerce program, wide use of this mechanism (the RDLP) is being encouraged to assist firms and other private sector organizations to raise money for R&D and for the subsequent commercialization of new products and processes. We have produced extensive documentation on RDLP's and how they can be accomplished, and are conducting intensive outreach activities to get the information to potential users. The RDLP is one alternative to in-house funding or, in the case of very large projects, joint R&D arrangements.

An example is the recent Genentech RDLP, involving about $55 million worth of technical work to be carried out. These in-place incentives are most helpful but as you can see, we can also identify the weaknesses and this is where we need help.

For example, while the use of R&D limited partnerships has provided private sector funds for the prototype or pilot plant steps, there still are insufficient incentives for venture capital to fund higher risk, early stage developments that may be many years away from commercial operation. A major weakness exists between the first technical demonstration in the laboratory and the prototype stage.

As a result, foreign companies have found that they can acquire or license early stage development in the United States at very low cost, at a time when such development is undercapitalized and very vulnerable. In effect, these foreign companies are benefiting from major U.S. basic research investments at very low cost by providing development funds that are not equally available in the United States. Therefore, we need to find ways to increase the incentive for the private sector to take the risk of exploiting our advanced technology.

Let me discuss briefly the need for removing barriers to joint research arrangements. In this regard, U.S. firms have consistently expressed the view that they are handicapped in competing in international markets because our antitrust laws inhibit joint research and development. U.S. firms say they are hesistant to invest heavily in joint research and development projects because of the high risk of treble damages and criminal sanctions under existing antitrust law.

The high risk perceived by U.S. companies in conducting joint research and development has persisted despite the Department of Justice "Antitrust Guide Concerning Research Joint Ventures," which attempts to clarify how the antitrust laws apply to a given set of facts. For one thing, guidelines by their nature have to be somewhat ambiguous to allow room for flexibility of enforcement policies which can vary from one administration to the next. There is a limit to how much any given statute can be clarified by guidelines or through the review procedure to get desired results in the antitrust area, given the role of the courts and the general language of the Sherman and Clayton Acts.

The Business Review Procedure of the Department of Justice also has not dispelled industry's fear in this area.

Mr. Chairman, given that we do not believe industrial policy to pick winners and losers is a valid concept, we vitally need to be relieved of some differences between U.S. and foreign antitrust laws and practices that place U.S. industry at a disadvantage in the international marketplace. Therefore, I am pleased that you are holding this hearing. And I can't overstate my concern on this subject.

What would be most helpful in respect to promoting joint R&D ventures? First, the listing of conditions for joint R&D ventures as now found in some proposals is contrary to the cornerstone of this administration's policy to minimize Government intervention in the marketplace. All that should be necessary is a notification to the Government identifying the participants of a joint venture.

In sum, we believe the essential elements of a joint R&D bill are to assign only an enforcement role to the Government; to protect joint R&D ventures from all private and Government damage actions; and to eliminate all conditions, except notification to the Government of the venture, its participants, and its scope.

I am pleased to say that these three elements will be included in the R&D section of an antitrust reform package which is under review in the administration. This package would exempt joint

R&D from all private and Government actions for damages under the antitrust laws based on conduct that is part of a research and development program that has been disclosed to the Government.

The proposal under review in the administration would thus avoid any Federal interference as to how the joint R&D venture will be conducted. Further, only notification of the joint venture to the Government is required.

I am confident that the enactment of this proposal will remove any disadvantage our antitrust laws now imposed on U.S. industry in conducting joint research and development.

In addition to the new R&D section, the proposal under review in the administration contains four additional reforms in the antitrust laws which are of equal importance.

I want to thank you again for the opportunity to participate in these hearings which will develop the record on the importance of joint R&D and the urgent need to remove the disadvantage our antitrust laws impose in this area. We would be pleased to work with your committees to develop such a bill.

[The prepared statement of Dr. Merrifield follows:]

STATEMENT OF
D. BRUCE MERRIFIELD
ASSISTANT SECRETARY OF COMMERCE
FOR PRODUCTIVITY, TECHNOLOGY AND INNOVATION
BEFORE THE JOINT HEARING OF THE SUBCOMMITTEES ON

INVESTIGATIONS AND OVERSIGHT

AND SCIENCE AND TECHNOLOGY

OF THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY
JUNE 30, 1983

JOINT RESEARCH AND DEVELOPMENT: A TOOL FOR PROMOTING U.S. TECHNOLOGICAL CAPABILITY

Honorable Chairmen and members of the Committees, thank you for this opportunity to discuss my views on joint research concerns, particularly as they relate to the antitrust laws.

I want to state right away we need to change our antitrust laws to encourage more joint research and development.

Joint research and development programs can be procompetitive. They reduce duplication, promote the efficient use of scarce technical personnel, and help to achieve desirable economies of scale. Small firms are able to collaborate in joint research and development projects, which because of prohibitive costs, they could not do by themselves. Large firms are jointly able to tackle today's large and complex technological problems, which are often beyond the ability of single firms. For all of these reasons, joint research efforts are key factors in the ability of countries to stay competitive in the international marketplace.

. Our major trading partners have focused collaborative efforts on research and development in high technology industries. These countries and the European Economic Community have been able to target for intensive joint research and development certain high tech industries, where the U.S. has a tecnological lead. As a result our foreign competitors have been able to narrow the gap or to achieve preeminence in many of these industries.

Of greater significance to us currently is that Japanese antitrust law did not prohibit firms from conducting collaborative research and development in MITI targeted areas such as computers, microelectronics, electronic instruments, lasers, optical communication, robots, and aerospace. Earlier this year Mr. Kuzuhero Fuchi, Director of Japan's Institute for New Generation Computer Technology (NGCT), announced a ten-year collaborative joint research and development venture with industry to create a so-called "Fifth Generation" computer. With this program tne Japanese hope to leapfrog the U.S. computer industry.

Similarly, French antitrust law did not deter French firms from conducting massive joint research and development projects in such areas as aerospace, telecommunications, microelectronics, energy, and conservation equipment. West German firms also have not been inhibited by antitrust restrictions in conducting joint research and development in computers, microelectronics, and electronic office equipment.

Further, the European Economic Community has exempted several collaborative joint research agreements of individual member countries from the antitrust restrictions of Article 85 of its Treaty. For example, the European consortium Airbus Industrie led by France and West Germany has been able to conduct joint design, testing, and manufacturing, which assisted them in capturing roughly a quarter of the jet aircraft market in 1981. Prior to that, joint research and development had been authorized in such areas as nuclear oxide fuels and electronic components.

So much for the state of cooperative effort in other countries. Why is it important and what is its status in the United States? Let me review briefly by talking about something I call the Innovation process pipeline.

The Innovation/Process Pipeline

In our effort to address this issue and devise effective policy solutions, it is useful to think of the process of technological innovation as a "pipeline." This highlights the fact that technological innovation is a continuous process, and not a discrete event.

In general, innovation can be considered to have two major stages. The first stage is the invention. The second is translating that invention into a useful commercial product or process. The large majority of the cost, the risk, and the time is associated with the second stage. It is commonly understood that in major industries, it takes seven to ten years to produce a significant new product or process to move through this pipeline. Perhaps one of twenty projects that starts out in the laboratory ever produces a positive cash flow. Innovation, therefore, entails high levels of risk, and if the national interest requires that the United States maintain world technological leadership, then it is also important to remove barriers to innovation and to provide appropriate incentives to undertake risks.

Without adequate incentives, much of the innovative, basic R&D that is done in the United States will never be translated into useful products or processes. For the "pipeline" to work properly, we need to remove barriers to collaborative effort and provide incentives to cooperate which will minimize risk. Also needed, of course, as I mentioned in the context of our maintaining international competitiveness, is an adequate supply of scientists and engineers; access to capital for R&D and machinery; sound management; access to critical information; and a stable economic environment that is conducive to business decisionmaking.

Our own review of this innovation process has led Commerce to conclude that Government policies and programs exert a major influence, including effects on the direction and rate of technical development. For example, influential factors include Government procurement policies, R&D support, patent policy, antitrust, tax, education initiatives, and so forth.

Two examples of recent Government actions designed to strengthen this innovation process are:

- The provision of about $6.6 billion of Federal funds in fiscal year 1984 for basic R&D, including an 18 percent increase in programs of the National Science Foundation, and new initiatives in the Department of Energy and NASA;
- The Economic Recovery Tax Act (ERTA) which removed tax disincentives primarily for investment in plant and equipment.

Finally, going back to my chart for a moment, let me tell you about the Industrial Technology Partnership (ITP) program that we have developed at Commerce to aid in generating more Research and Development Limited Partnerships. It relates more to the right hand or development side of the process diagram. Under this new Department of Commerce program, wide use of this mechanism is being encouraged to assist firms and other private sector organizations to raise money for R&D and for the subsequent commercialization of new products and processes. We have produced extensive documentation on RDLPs and how they can be accomplished, and are conducting intensive outreach activities to get the information to potential users. The RDLP is one alternative to in-house funding or, in the case of very large projects, joint R&D arrangements. An example is the recent GENENTECH RDLP, involving about $55 million worth of technical work to be carried out.

But, using this notion of the innovation process as a continuous pipeline, we can also identify weaknesses in the process, and this is where we need help. For example, while the use of R&D Limited Partnerships has provided private sector funds for the prototype or pilot plant steps, there still are insufficient incentives for venture capital to fund higher risk, early stage developments that may be many years away from commercial operation. A major weakness exists between the first technical demonstration in the laboratory and the prototype stage. As a result, foreign companies have found that they can acquire or license early stage development in the United States at very low cost, at a time when such development is undercapitalized and very vulnerable. In effect, these foreign companies are benefiting from major U.S. basic research investments at very low cost by providing development funds that are not equally available in the United States. Therefore, we need to find ways to increase the incentive for the private sector to take the risk of exploiting our advanced technology.

Removing Barriers to Joint Research Arrangements

In this regard, U.S. firms have consistently expressed the view that they are handicapped in competing in international markets because our antitrust laws inhibit joint research and development. U.S. firms say they are hesitant to invest heavily in joint research and development projects because of the high risk of treble damages and criminal sanctions under existing antitrust law.

The high risk perceived by U.S. companies in conducting joint research and development has persisted despite the Department of Justice "Antitrust Guide Concerning Research Joint Ventures," which attempts to clarify how the antitrust laws apply to a given set of facts. For one thing, guidelines by their nature have to be somewhat ambiguous to allow room for flexibility of enforcement policies which can vary from one Administration to the next. There is a limit to how much any given statute can be clarified by guidelines or through the review procedure to get desired results in the antitrust area, given the role of the courts and the general language of the Sherman and Clayton Acts.

The Business Review Procedure of the Department of Justice also has not dispelled industry's fear in this area. The Business Review regulations provide that upon a request setting forth proposed business conduct, the Department of Justice may issue a letter stating its present enforcement intention. It does not shield the venture from future DOJ challenge, and is not binding on the courts in private suits. Moreover, there is no assurance that the enforcement policy stated therein will not change from one Administration to the other.

Proposed Action

Mr.Chairman, given that we do not believe industrial policy to pick winners and losers is a valid concept, we vitally need to be relieved of some differences between U.S. and foreign antitrust laws and practices that place U.S. industry at a disadvantage in the international marketplace. Therefore, I am pleased that you are holding this hearing.

What would be most helpful in respect to promoting joint R&D ventures? First, the listing of conditions for joint R&D ventures as now found in some proposals is contrary to the cornerstone of this Administration's policy to minimize Government intervention in the marketplace. All that should be necessary is a notification to the Government identifying the participants of a joint venture, and a description of the R&D to be undertaken, accompanied by any agreements between the participants.

In sum, we believe the essential elements of a joint R&D bill are:

(1) Assign only an enforcement role to the Government;

(2) Protect joint R&D ventures from all private and Government damage actions; and

(3) Eliminate all conditions, except notification to the Government of the venture, its participants, and its scope.

I am pleased to say that these three elements will be included in the R&D section of an antitrust reform package which is under review in the Administration. This package would exempt joint R&D from all private and Government actions for damages under the antitrust laws based on conduct that is part of a research and development program that has been disclosed to the Government. The Government, however, could seek an injunction to halt any actions by the joint venture thought to be harmful to the competition.

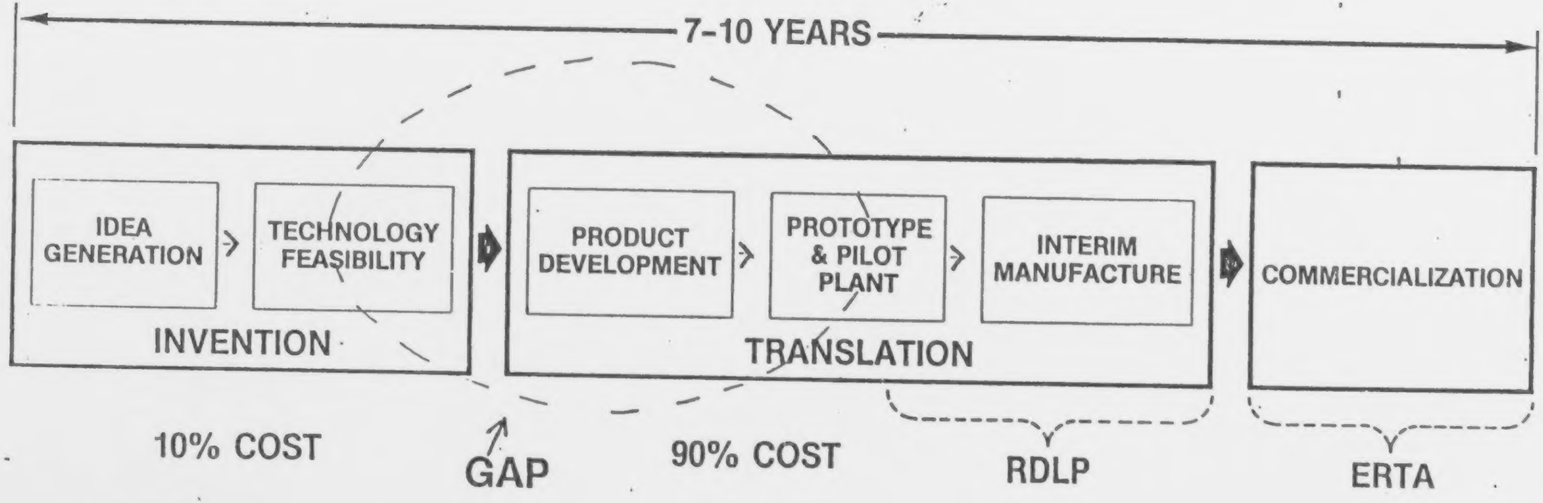
The proposal under review in the Administration would thus avoid any Federal interference as to how the joint R&D venture will be conducted. Further, as only notification of the joint venture to the Government is required, the "paperwork" burden on the private sector and the Federal Government would be minimal.

I am confident that the enactment of this proposal will remove any disadvantage our antitrust laws now imposed on U.S. industry in conducting joint research and development.

In addition to the new R&D section, the proposal under review in the Administration contains four additional reforms in the antitrust laws which are of equal importance. These additional reforms are: a section which would eliminate treble damages for non per se antitrust violations; a section assuring that Intellectual Property licensing under the antitrust laws is a non per se offense; a section dealing with patent and copyright misuse; and a section dealing with process patents.

I want to thank you again for the opportunity to participate in these hearings which will develop the record on the importance of joint R&D and the urgent need to remove the disadvantage our antitrust laws impose in this area. We would be pleased to work with your Committees to develop such a bill.

INNOVATION



7-10 YEARS

IDEA GENERATION > TECHNOLOGY FEASIBILITY

INVENTION

PRODUCT DEVELOPMENT > PROTOTYPE & PILOT PLANT > INTERIM MANUFACTURE

TRANSLATION

COMMERCIALIZATION

10% COST

GAP

90% COST

RDLP

ERTA

$6.6 BILLION FY 1984
U.S. GOVERNMENT
BASIC RESEARCH

Mr. WALGREN. Thank you very much, Dr. Merrifield. I appreciate that testimony.

Dr. Baruch.

STATEMENT OF DR. JORDAN J. BARUCH, CONSULTANT AND FORMER ASSISTANT SECRETARY OF COMMERCE FOR SCIENCE AND TECHNOLOGY

Dr. BARUCH. Perhaps I should say Messrs. Chairmen, thank you very much for inviting me here today. First I would like to echo Congressman Zschau's congratulations to you. This has been far and away the most interesting set of hearings I have participated in in recent years either willingly or unwillingly and I think an extremely educational one.

I will take your offer to submit my written testimony for the record and as a result will briefly summarize a couple of the items on it and then actually expand on one of the items.

The antitrust problem which was pointed out quite graphically as Ky Ewing mentioned in the study of the Advisory Committee on Industrial Innovation under the Carter administration, has been well covered and I think given the authorities present and future today, it would be presumptuous of me to add or comment.

I would like to comment on the Merrifield proposal for joint R&D partnerships. It is a valuable addition to the industry engaged in research and development and in innovation. It will, as you will see later in my discussions, really be applicable to a limited set of both technologies and industries because it requires an industry that can make commitments to take the results of that research and it also requires research on close enough in developments so that industry can make the judgment to take it.

The same is true for MCC that we heard yesterday from Admiral Inman, and in Dr. Bloch's proposal, they talked about research and development in solid state semiconductors.

I would like to point out, however, they are both talking about research again in the close-in end of that innovation diagram over there toward the right where you are already conceiving product developments, as a matter of fact. Eric Bloch talked specifically about a four-megabit memory. That is a chunk of hardware. Neither of them talked about investigating the semiconductor processes of organic molecules that have been reported in the chemistry literature or some of the exciting new developments that have been reported in the past several issues of physics today.

There is no organization either in industry or in government to deal with that middle ground of generic or basic technology. I have been invited later on this summer, Mr. Chairman, to testify on the bill to establish a national technology foundation of Mr. Brown's favorite project, but if you would not object, I would like to take one part of that bill and talk about it today because I think it is critical to the hearing that you are holding because of the discussions about Japan.

Yesterday we heard quite clearly that Japan, through ICOT, has been supporting research in a basic technology short of product development, to the left of the product development side there, but to the right of basic research. Essentially in the crack where the arrow is, that is where we have been falling, in the crack. We have not got a program in that area.

ICOT has done it and has said, as we would, that the added value and the competitive pressure will come from converting that technology into new products and new processes that give a company an economic advantage.

Today I would like to talk in a little bit of detail about the vision I have of the joint R&D partnership, not a partnership simply among companies in the United States but a joint partnership among industry, academe, and the Government where the Government isn't intervening but is, in fact, participating in this effort.

I am also going to take an unpopular position—at least at the present time—because what I am going to suggest is going to look like spending money and I want to ask you before I start to keep in mind as you would if you were undergoing a private business consideration the distinction between expenditure and investment because I really am going to ask the Congress to think about investing money.

I would like to talk about an organization, a generic technology center or industrial technology development center whose task is to take the state of current science and build the fundamental technologies and techniques on it that will secure the benefits of that science for industries of the future, not for well-established industries of today, but for the industries that we have to have because other countries are concentrating on creating them.

We were told yesterday, for example, about carbon fiber and how the activities of Japanese resulted in carbon fiber being applied to sporting goods whereas ours had it applied to military hardware.

We need to look to the technologies of the future that can be incorporated by civilian marketable industry.

I would like to talk about three functions of these centers. One is the creation of new technology short of product development and short of process equipment development so that companies will compete later on.

Second, the collection of existing domestic and foreign information on these technologies even if it means translating from the Japanese or the German or Swahili for that matter.

Third, the task that they diffuse the knowledge that they create to American firms, and I would even like to suggest two mechanisms for doing that. In my discussion, I hope you will also see that there are advantages in this kind of proposal for the educational system for engineers which has also been pointed out as an important problem we face.

Really, we should be asking ourselves who will pick the technologies for these centers. After all, if there are innovations for industry of the future, we can't ask the industry leaders to come in and pick them. They don't exist yet.

Although there are industries that will develop in these directions, my suggestion would be that the selection, at least of the menu, of such possible centers be brought up by a group drawn from the two national academies, science and engineering, probably by Presidential appointments with the concurrence of the Senate.

As a result the Members might well be political but at least you can be sure they will be competent.

Next, I would recommend that this group, under the aegis of some organization like a national technology foundation, engage in what the Japanese engage in, the building of a consensus, the soliciting of responses and participation from industry and from government and from academe that these indeed represent technologies on which we can build future industries.

Then I would like to see this group recommend a set of potential sites for such a center. For example, right now, material science is developing exotic materials like fine ceramics, supercooled metals, rapidly solidified metals, and so on.

Suppose we were to set up a center to see what technologies we could build so that our rapidly damaged metals industries in this country might make the transition to more exotic structural members. It would be nice if the national technology foundation had funds available for a set of design competitions so that they could go to a group of universities or industry consortia or Government laboratories and solicit a designed competition for such a center.

After judgment, one would like to see that center—its construction and its maintenance and its central staff—supported as a line item by the Congress. Under the administration, the center itself would probably be administered contractually by a university or industrial consortium or by some other mechanism that joined the two together.

Lastly, and this has an important bearing on diffusion, I would like to see us take a leaf from the Japanese ICOT book and that is to have that center openly accessible to researchers from industry, from academe, and from the Government laboratories such as the National Bureau of Standards.

I would like to see that free access not only available but encouraged and perhaps have the companies encouraged to have their people there on a rotating basis. Long studies have shown us, Mr. Chairman, that the best technique for transferring technology is the transfer of people. It transfers best inside somebody's head, not by a written report. It would be nice, then, to see those people rotate from these centers back to their industries and back to their academic institutions where they would become better professors more closely tied into reality.

Note that such a center would have rather expensive equipment in many cases and as such would be a national resource but a national resource that is unique and one that would not require the location of expensive equipment at each university but rather a central place where many universities could have access to it much as we have done in the past in the field of physics at Aricebo or the linear accelerator program.

Lastly, I would like to see this organization charged with the active diffusion of the knowledge they produce through a set of regional centers. My guess is you don't want to have diffusion done through a central office because the concerns of southern California are different from the concerns of the Ohio Valley and different from the concerns of the Middle Atlantic States. The interests in industry are different, the levels of knowledge are different and while the centers should have free communication among them, there ought to be somebody familiar with the industrial milieu in which they function so that the diffusion can be as relative as possible to the industries that exist.

Mr. Chairman, I know I have taken an unpopular task. Hearings and legislation are going to be critical to our development of a national commitment to technological and industrial leadership but so are the appropriations. And I urgently hope that the impetus that this group has gotten through these hearings will carry on to the appropriations activities of the Congress as well and we will get some of these urgently needed tasks funded.

Thank you very much, Mr. Chairman, for your attention.

[The prepared statement of Dr. Baruch follows:]

Testimony of
Dr. Jordan J. Baruch
June 30, 1983

Mr. Chairman:

Thank you for the opportunity to testify today on the opportunities opened to the United States by the growing competitive success of the other industrialized nations. Before I start the substantive part of my testimony, however, please permit me to introduce myself.

I am currently a consultant, primarily in the area of strategic technology planning and management. I hold a doctorate in electrical engineering from MIT and have taught there, at the Harvard Business School and at Dartmouth College in both Management and Engineering. In industry, I helped found a small company --Bolt Beranek and Newman Inc. — that is now a multi-million dollar firm in consulting and computers. I have also been a Department General Manager at the General Electric Company. In government, I served as Assistant Secretary of Commerce for Science and Technology and head of the Office of Productivity, Technology and Innovation. As a result, I have been intensively immersed in the cultures of Academe, Industry and Government over my career. I hope that this multiple exposure will permit my testimony today to reflect a balance among the biases those cultures tend to introduce.

In my opening, I used the term "opportunities" advisedly because I am convinced that our friends' sucesses will finally provide just the kind of challenge that this country needs so desperately. To put it simply, we have been challenged to demonstrate that Industry, Academe and Government can work together, under a threat short of war, to advance the interests of the public.

We are faced with the kind of challenge that may finally break the paralysis that has gripped this country for many years. While the leaders in Japan have rallied industry, government and academe behind a national purpose aimed at making their country an economic leader in the western world, we have clung to the simplistic notion that if government, academe and industry all pull in the directions dictated by their own self-interest everything will come out alright. Other nations invest huge sums to advance their industrial technology, to increase the quality and quantity of the engineers they produce and to insure their industries the capital credit necessary for modernization. We on the other hand, simultaneously bemoan the shortage of innovation and of skilled technologists and cut our educational budgets, squander our nation's credit and spend less on national technological endeavors than we do on arcade games. Even today when other countries have made clear that they view the nation as the fundamental unit of business when dealing with the outside world, we apply the same strictures to our industry in trade that we do in their dealings with our domestic population.

Recognizing that we face an opportunity growing out of challenge, I would like to discuss several things today.

First, I'd like to address myself briefly to the anti-trust questions that are currently facing Congress. Second, I would like to address the specific program that Secretary Merrifield has put together. Third, I'd like to open to the Congress a series of options that have grown out of intensive joint efforts of industrial, academic and government people and to suggest an on-going umbrella effort that will continue to create new options and insure that we never again get sandbagged by our industrial competitors.

1. Anti-trust

The Congress is currently considering legislaiton that will protect companies engaging in joint research from anti-trust attack by either the government or third parties. The Congress has heard and will, I'm sure, hear again today that such legislation is "unnecessary"! They will hear and have heard that such legislation "overprotects" the companies engaging in joint research. While the Congress, of course, must listen to such pleadings, I hope that they will pay close attention to their source. Is the person claiming that the legislation is unnecessary a representative Chief Executive Officer who ultimately must make the decision whether or not to join in research and development with other companies? If so, the legislation may indeed be unnecessary. Does the pleader represent corporate attornies willing to lay their reputation on the line when they advise their clients to go ahead and join in research and development despite the absence of the legislation? Again, the legislation may indeed be unnecessary. If the pleader, however, is an attorney who makes his living from suing for anti-trust legislation and is thus one whose business will presumably be damaged if companies were protected from this type of suit, the pleading may merely reinforce the necessity for the legislation.

When a dozen or so companies join together to form the organization that Admiral Inman now heads, they received letters from a famous anti-trust lawyer warning them that their actions would bring down on their heads grave consequences. I suspect that letter was in the nature of a self fulfilling prophecy and that the aforementioned famous lawyer will soon find a client to bring just the kind of suit that he predicted. It seems to me that such activities are eloquent testimony to the necessity for the current anti-trust legislation.

While there exists proposed legislation, I would like to describe some criteria that I see for anti-trust legislation to stimulate industrial innovation in this country in general. First, as in the case of the present legislation, it must protect joint research and development activities and yet must make sure that it is not protecting joint activities in production, marketing or price fixing that reduce domestic competition and inhibit the entry of new companies in a competitive posture. Indeed, I would like to see the legislation not merely protect joint research and development but actually encourage it. While it encourages joint research and development, however, it must make sure that it is still economically possible for members of an industry to pursue research directions not covered by that joint activity. Lastly, on my list of criteria, I'd like to see the legislation encourage joint research and development among United States companies while excluding foreign firms, foreign-owned subsidiaries or other U.S. divisions or entities that would merely served as a conduit to foreign companies for the results of that joint research and development.

When I have discussed these criteria with members of the legal profession, they have told me how impossible it would be to draft such legislation -- how narrow a line I would ask them to tread — how finely the work would have to be honed. These are the same people who show no hesitation at all in describing similar criteria for engineering solutions to national problems. These represent the same profession who told the automotive engineer how efficiently an engine must operate and yet how few pollutants it must produce. I'm afraid I cannot sympathize. I have heard for years how the best minds leaving our universities are going into the law. I think it is appropriate to ask them to operate in the public's interest. I think it is fair to expect from the legal profession the same level of ingenuity and dedication that they feel free to expect from the other professions in our society.

There is a more complex area of anti-trust law, however, that needs attention. It is an area that will require the joint efforts of our best legal and economic minds to address. One can demonstrate that a fragmented industry, an industry composed of many small, independent competitors, does not and will not spawn technological innovation. One can similarly show that an industry controlled by a single, unregulated monopoly has no incentive to innovate. In between these two extremes, innovation takes place. Indeed, in the case where there is a leader in an industry that shows a positive return to scale and where anti-trust laws prevent the growth of natural monopoly, innovation takes place rapidly. The computer industry is one example of such an industry.

Current anti-trust laws show little recognition that the structure of concentration in an industry is an important determinant of that industry's rate of technological innovation. It would be a far-sighted step indeed for the congress to direct a study of that question and, from the study, develop detailed legislation or guidelines to ensure that our anti-trust laws encourage innovation as well as competition.

2. The Merrifield Plan for Industrial Innovation

Secretary Merrifield has described the program that he has recommended to encourage the financing, development and commercialization of new industrial technology. His program rests on the same tax laws that other limited R&D partnerships have used, but it is significantly different. In the ordinary limited partnership, the limited partners get their money back through a tax shelter scheme; the proposer of the research and development thus often feels little responsibility for a critical analysis of the commercializability or even of the realizability of the proposed technology. We must realize that every such partnership that leads to an uncommercialized technology is, in fact, a wasteful expenditure of public funds. It is, after all, the non-receipt of those public funds that reimburses the limited partners for their investment.

Recognizing that such low-responsibility partnerships are, in fact, really contrary to public policy, Secretary Merrifield has proposed an ingenious structure that greatly changes the odds that the public's money will be well-spent.

In his scheme, as in any soundly-based industrial research and development program, one starts with a group of corporations that not only describe a technology that they would like to see created but, through take-or-pay agreements put their money where their their mouths are! Further, the partnership is structured to use the best research capabilities in industry, academe or even government laboratories to accomplish the technological task. I won't take the time to cover the other details of the program because Secretary Merrifield can do that, of course, much better than I.

Both the Merrifield proposal and the Norris program that Admiral Inman has described to you are aimed at joint R&D activities in support of industries that are already quite successful. In the case of the Merrifield program, one needs companies who are financially secure enough to enter into irrevocable take-or-pay agreements. In the case of MCC, one needs subscribing firms that are financially secure enough to commit the necessary resources for the task. In addition, and critical to what I will be discussing later, is the fact that both cases need companies that are currently engaged in the business to which the new technology will contribute.

3. A National Commitment to Technological Leadership

In 1980, the Congress passed and the President signed into law the Stevenson-Wydler Technology Innovation Act of 1980. In this session of the Congress, Mr. Brown of California introduced H.R.481, a bill to establish a National Technology Foundation. Both the act and the bill represent reasonable blue prints for what could become a national commitment to technological and industrial leadership.

Unfortunately, little has been done to back these efforts by either appropriation or by executive commitment. This hearing and others coming up may, however, indicate that the Congress is prepared to take the leadership role in establishing this national commitment. In light of that hope, I would like to bring this committee's attention to the results of a study that I was priveleged to lead in 1978 and 1979.

At President Carter's direction, an Advisory Committee on Industrial Innovation was formed, with representatives from industry, academe and government to examine what the Federal Government could do to encourage industrial innovation. Their final report is available from the Superintendent of Documents as stock # 003-000-00553-4 or from the National Technical Information Service as Item No. PB80-13175-8. Many of the recommendations that were culled from that final report have already been implemented and others are present in Stevenson-Wydler and HR481. Several of them, however, merit additional stress.

1. Industrial Technology Development Centers

   Secretary Merrifield and Admiral Inman have both indicated approaches to establishing centers for industrial technology that rely primarily on the private sector. As pointed out earlier in this testimony, however, such centers must necessarily deal both with technologies on the verge of industrialization and with industries financially capable of supporting the further research and development activities. What about technologies like light aircraft construction where the R&D may be aimed at advanced technology but where the industry can ill-afford to support such a center? This is an industry where the United States has long held a dominant position but one which is rapidly being taken over by the Japanese. Some other mechanism will have to be found to support the development of such technologies.

Of even greater importance, however, is the task of developing the technologies that will capitalize on recently developed areas of science. Will we have the tools and methods in fermentation technology, bound-enzyme technology and other vital areas that will permit our rapidly advancing discoveries in biology to make the transition to the effective creation of economical medications, pesticides and agricultural products? Will we have the technologies, tools and methods to incorporate rapidly solidified metals, ceramics and other exotic materials into the complex structural elements that may represent the future of our metals industry just as integrated circuits have become the future of our vacuum tube industy? Will we have the tools, technology and means to incorporate our scientific findings in tribology and corrosion into the structures that will reduce the wear in our machinery and the deterioration of our bridges? Or will we assume, as we have in the past, that industry -- with its minimal incentives -- will take over that task and gradually incorporate the scientific findings into the industries of the future? More to the point, perhaps, will we assume that there is nothing the United States can do about it since Japan, Germany and others will do the commercial conversion and maybe we can buy licenses with our income from agriculture and mining!

Mr. Chairman we can have those technologies, we can develop the tools and the means for capitalizing on research. We can develop the technologies, as a nation, that our industries are incapable of developing because of their economic constraints.

It is now time for us to recognize that the Industrial Technology Development Centers provided for both by the act and the bill must represent national, public investments. It is time to give up the idea that these can be self-sustaining activities any more than the major astronomical installations used by our scientific researchers can be self-sustaining installations.

A board of scientists and engineers -- which I recommend be drawn from the membership in our National Academies — can prepare a list of such critical centers where the economic pay-off is clear, where the scientific underpinnings exist and where appropriate sites can be found for their creation. The National Technology Foundation should have sufficient funds to support design competitions for those centers. The creation and maintainance of each center should be funded as a line item in the Foundation's appropriation and access to those Centers should be guaranteed for industrial researchers, academic technologists and government researchers whose projects can pass the Foundation's review mechanism.

The technology coming out of those centers should be well protected and licenses should be made widely available to United States companies who can then compete in the incorporation of those technologies into individual products and processes. While reasonable fees should be charged for such licenses, the primary return to the treasury will be through taxes on the increased economic activity of the firm's that utilize the technologies. Economists have shown that such returns far exceed the investment.

Mr. Chairman, I recognnize that my testimony on the modus operandi of these Centers differs significantly from testimony that I have previously given. There are two reasons for that difference. First of all I have continued to learn since those earlier days and secondly, I am today testifying as a private citizen rather than as one under the constraints normally imposed on a government official.

2. Foreign Technical Information

In 1977, one Japanese trading company spent $27M collecting and disseminating information about foreign technology to its clientele. The United States still makes no serious effort in that direction. It seems to me that if the National Technical Information Service is really to perform the function that its name implies, it should have the task of gathering, organizing, structuring and disseminating foreign technical information. I will be dealing in more detail with this subject and others related to the National Technology foundation when I testify in July.

3. Labor Technology Forecasting

The last function that I would like to discuss that seems to fall under the of the National Technology Foundation is a labor technology forecasting system. It is almost a certainty that technological developments at the technology development centers and developments in industry itself will lead to production technologies that may have a serious potential impact on labor. For straight economic reasons, as well as to ensure the participation of labor in the changes to those new technologies, it is imperative that we put into place a system for forecasting both the existence and the impact of those new technologies. Without such a system in place labor is forced to ask the question, "How do we resist these new technologies" rather than, "How do we ensure labor's role in these new technologies?" It seems reasonable that the National Technology Foundation should work with the Secretary of Labor develop a labor-technology forecasting system in conjunction with both labor and management. The forecasts produced by this group will provide the basis for plans to accomplish labor retraining and other adjustment activities. By using modern forecasting techniques they will provide the necessary lead time to ensure that such activities are effective.

Mr. Chairman, time precludes my discussing the myriad of added options open to us once we commit this nation to a path of technological industrial excellence.

- The collection, organizing and dissemination of foreign market information.
- The computerization of our patent system
- Environmental regulations based on performance rather than structure.
- Capital-gain rollover provisions to encourage investment in small technologically based firms

and many other approaches that you and the National Technology Foundation can propose will focus our attention and our resources on the task. We can do it, we must do it -- only you can determine if we will do it. Schumpeter was right when he declared innovation to be a matter, not of the intellect, but of the will. Do we have the will to proceed?

Mr. Chairman, let me thank you again for permitting me to testify today and for holding this hearing. Hearings and legislation are critical to the development of a national commitment to technological industrial leadership. When they finally lead to congressional appropriations -- even if those must be made in the face of OMB's inability to differentiate between expenditure and investment -- that national commitment will become a reality.

Mr. **Walgren**. Thank you, Dr. Baruch. We appreciate that very much.

I want to turn now to the Members for discussion in the panel. I think in view of the number of Members, panel, we should limit ourselves to the 5-minute process and perhaps we will be able to graft some flexibility into that.

Mr. Gore.

Mr. **Gore**. Thank you very much, Mr. Chairman.

Mr. Baxter, in your statement you covered a broad area of antitrust laws. Many of them went beyond the research joint venture area. Focusing just on the research joint venture area, the impression that I get from all witnesses that we have talked with, including this panel, is that there has not been any instance in which a court has ruled that a research joint venture violated the antitrust law. Am I correct so far?

Mr. **Baxter**. I believe that is correct.

Mr. **Gore**. Now, in spite of that fact, there is a perception on the part of American business that our antitrust laws do prohibit research joint ventures, but, in fact, that perception is probably incorrect in most instances.

Mr. **Baxter**. I don't think there is a perception that they prohibit them. I think there is a perception that the collaborative activities that one engages in after one sets up a joint venture run a high risk of being held in violation and that the uncertain exposure to private treble damage action is the deterrent.

Mr. **Gore**. Wait a second. That is going beyond the research joint venture.

Mr. **Baxter**. The mere formation of it.

Mr. **Gore**. And the activities conducted by the research joint venture?

Mr. **Baxter**. No, I think it is the activities as to which there is a high level of uncertainty.

Mr. **Gore**. Well, has there ever been a case—if there has never been a case where it has been ruled out by the antitrust laws, then you can perhaps see why I am asking the question. Is it a matter of perception alone that we need to change?

Mr. **Baxter**. I think it is largely a matter of perception.

Mr. **Gore**. Dr. Merrifield?

Dr. **Merrifield**. Congressman, I think you have to recognize that the true index here is actually the number of joint ventures that have been formed. There are very few and the perception of risk is so great that that is why. Now, the ones that have formed so far it is true have not experienced any problem but there really aren't very many. The MCC thing is really the only significant one in recent memory that has been formed.

The others are very, very small and basically these have not involved anticompetitive arrangements. So I think that the lack of activity is the true measure of the concern that exists in industry.

I have been in industry for 25 years and had to work with these situations and I will tell you, it is almost impossible to get people together even to talk let alone to undertake something of this sort.

Mr. **Gore**. Well, isn't there some reluctance, some substantial reluctance that is due to just an unwillingness to share research? Isn't that one of the major problems?

Dr. **Merrifield**. Of course, and again, there are lots of inhibitions here. That is one. When you compound it with risk, then forget it.

Mr. **Gore**. Well, I had a number of other questions but there are a number of our colleagues here and I will hold my questions. At this point, let me just summarize with one brief statement.

We often overreact when a problem is perceived and defined and there is a rush to do something about it. We have all seen that happen quite a bit. I am concerned that we not overreact in this situation as well, particularly if the largest part of the problem is a misperception on the part of American business that things are going to be ruled in violation of the law that really are permissible. MCC certainly has had no problem in proceeding and if there are changes which need to be made, then let's make them but let's not go in and do wholesale damage to the fabric of the antitrust laws if that is not necessary.

And a second part of the same point is that the changes which are necessary and would be helpful will, in fact, be jeopardized by a legislative strategy that tries to tie them to much more sweeping revisions of the antitrust laws of the kind that just simply will not command the support of the majority of the American people. I think Mr. Baxter might have wanted to comment on that.

Mr. **Baxter**. Yes; I think it is easy to overstate or unduly denegrate what lies behind these concerns. The kind of cases that would quite likely be brought. Let me give you an example. If three or four companies in industry got together and made an important breakthrough somewhere, it is foreseeable that other companies in the industry which hadn't chosen to join the group when it was time to put their money upfront would then file antitrust actions claiming that the joint venture, the holding of that now developed technology proprietary by the companies that had put their money upfront, was a collective refusal to deal and probably claim it was a boycott and illegal per se. Although it is true that there are no cases so holding on those precise set of facts, the plaintiff could win. There are lots of closely analogous cases that one could cite.

So I sympathize with these concerns. They are not baseless just because one cannot point to any precedents.

Mr. **Gore**. Thank you, Mr. Chairman.

Mr. **Walgren**. Dr. Merrifield.

Dr. **Merrifield**. Let me just comment once more on this. The bottom line is that we are in a tremendously competitive world market and that we have three options. One is to exit these businesses which we are really being forced to do. The second is to try to raise trade barriers that have terrible consequences, and the third is to collaborate on a scaled effort that can be world competitive and that is the bottom line and we have to remember that that is the bottom line.

The alternative to effective collaboration is basically exiting these businesses. I can't overstate that.

Mr. **Walgren**. Thank you very much.

The time of the gentleman has expired. I think it behooves us to recess at this point for 10 minutes in view of the vote that is on the floor and how that would infringe on the Members' time. So if you can bear with us for 10 minutes, we will be right back.

[Brief recess.]

Mr. **Walgren**. Let me call us back to order and apologize for the inconvenience. If the witnesses would reassemble and let me recognize Mr. Brown.

Mr. **Brown**. May I say, gentlemen, that I am pleased to see the relatively large areas of agreement amongst the witnesses from the previous and present administrations on the need to take some action on the antitrust matter. I think it bodes well for getting some action.

I am personally concerned and have been for a number of years about what we can do to take care of the problems represented by that little circle on the chart here and as Dr. Baruch has mentioned, we have been interested in some legislative proposals.

Let me ask Dr. Baruch. It would appear to me that the first step might be the more vigorous funding of the Stevenson-Wydler Act to provide for the creation of some of these industrial technology development centers. Is that your perception of possibly the easiest way to move into this area on a limited scale?

Dr. **Baruch**. It would certainly be a good first step, Mr. Brown. One of the problems with the Stevenson-Wydler Act is that it assumes that these centers are going to be vigorously made into self-supporting kinds of activities. Pointing to that diagram, the more nearly we want them to be self-supporting, the more we have to move their activities to the right-hand side of the diagram so the companies can see a payoff. The more we want them to be self-supporting, the more they have got to restrict themselves to prosperous industries who can support them.

I think it is time for us to quit pussyfooting around and saying that these have to be self-supporting, it has to be private industry. You can't have one hand clapping. I think it is time for us to face the fact that at this end of the diagram where we already support basic R&D, there is a continuum and we have got to support with public funds the development of basic technologies, and economists have shown us that that kind of expenditure is repaid more than a factor of two even into the Federal Treasury by tax receipts.

Mr. **Brown**. We come closer to doing this in the defense area where the defense laboratory and the defense industry IR counts. We do a lot of this kind of work where the Government is——

Dr. **Baruch**. Unfortunately, rarely are those products the kinds of things you want for commercialization. We end up with carbon fiber aircraft instead of carbon fiber tennis rackets we can sell. And we also drain a lot of our engineering talent over into areas that are simply not useful for international competition at least peaceful competition.

Mr. **Brown**. Dr. Merrifield, I am sure you have perceived the problem here, but clearly it poses difficulty for this administration because of its political philosophy about intervening in areas that private industry ought to be able to handle.

Do you see any possible movement that could lead to some development to strengthen this pipeline, to strengthen this segment of the pipeline in addition to what you have already commented on?

Dr. **Merrifield**. Well, I do, and I am currently working with Treasury to identify options here and possible proposals that we can come up with. Just personally from my personal point of view, there are several different options that have pros and cons to them. One would be increased tax incentives for the R&D limited partnership concept that could make the risk so minimal for earlier stages that the private funding would reach back into the earlier stages of the pipeline. Another might be some form of guaranteed Government loans that would provide a degree of leverage and again diminish that risk.

A third might be a further reduction of capital gains and lock that into more venture capital for a 5- or 10-year period. Those are options. They have different pros and cons for them. They need to be carefully thought through and we are currently trying to do that, but certainly none of us have all the handles on the best ideas and so we would certainly appreciate any help with that.

Mr. **Brown**. Well, I am sure all the members of this committee are eager to try to reach an agreement on reasonable next steps. This is not a new problem for us really. The interest of this committee in things like the technology transfer process involving NASA and the Defense Department is the representation of our concern with moving technology into the commercial development and production phase in some reasonable way but obviously we have not succeeded in doing that.

Dr. **Merrifield**. One thought that we had also was that these national laboratories we have are really a tremendous national resource. They have spectacular capabilities and personnel and it is a marvelous place to build from. Again, if their contracts or their charters would allow them to set up limited partnerships to access venture capital from the private sector to develop some of the early developments that they have made, that might be another way to help that process.

Mr. **Brown**. I would like to work with you on a proposal of that sort. Of course, I think this is in the Stevenson-Wydler Act we sought to beef up that aspect of their work through a more professional approach to recognizing and rewarding personnel engaged in that kind of activity, and some other things of that sort, but again, it has limited success.

Thank you, Mr. Chairman.

Mr. **Walgren**. Thank you, Mr. Brown.

Mr. Volkmer.

Mr. **Volkmer**. Yes, I would like to ask Mr. Baxter what safeguards or what remedy would an individual or corporation have if it considered a group or person under the provisions as you mentioned as being anticompetitive? In other words, they fulfilled everything. We have passed the law that you suggested, and we have a group, let's say there are five existing corporations presently in a certain type of business, and four of them go into a joint R&D, leaving this fifth out here and it feels that it is specifically anticompetitive.

Mr. **Baxter**. Well, of course their remedy would be the time of the filing when the group was described and the nature of their efforts were described and of course all of that would be made public—to create an opportunity for the public and other companies to look at what was being proposed—to come in and bring problems to our attention, and any instance in which four out of five companies and industry where there are only five got in one

R&D joint venture, I would say was clearly not permissible under the antitrust laws.

Mr. **Volkmer**. In other words, you would view that in itself as being anticompetitive?

Mr. **Baxter**. I would. Yes, indeed. In most industries you have a number of companies there and there are opportunities for them to get together in twos and threes and when some group of companies that represents, let us say, 15 percent of an industry get together, not much of a problem is raised and there is no problem with people being excluded because there is room in that industry for four or five more groups of comparable size. So now your company's remedy is to get his own group of some such size together.

Mr. **Volkmer**. Except I don't have the capital.

Mr. **Baxter**. Well, the whole point is that this allows groups of companies to get together and pool capital but rarely, if ever should it be necessary to get as much as 50 percent of an industry together in a single group. If economies of scale really dictate that as much as 50 percent of an industry get together in a single group, why then indeed you have very, very serious problems as to the 49 percent who are not included. By definition, now, they cannot attain the scale economy that the more than 50 percent group has and they have a very powerful equitable claim to be permitted in.

On the other hand, once you let all the companies in an industry into a single R&D joint venture, you have a very unfortunate situation on your hands. Nobody has any incentive to increase the budget. Everybody has every incentive to reduce the budget of the industrywide joint venture. There is no possibility of getting ahead of your competitors because everybody is going to be entitled to whatever the joint venture produces. There is no possibility of falling behind because you are going to be entitled to whatever is produced. An industrywide joint venture is tantamount to repeal of the intellectual property laws with respect to that industry and we should resist that very, very strongly.

But when small subsets of an industry wish to get together and realize scale economies that should be permitted. So that I would say the answer to your question was they should complain loudly to us at the time of the filing and that is not an operation that we would look favorably on.

Mr. **Volkmer**. Well, let's assume that in your statement that you said 15 percent. Let's say that 15 percent do and yet there is one or two or three out here that are competitors that do feel it is anticompetitive and yet you go ahead and say, no; this is all right. What remedy do they have?

Mr. **Baxter**. On what grounds do they feel it is anticompetitive?

Mr. **Volkmer**. On the basis that they control, let's say, 15 percent; they control 40 percent of the market.

Mr. **Baxter**. Well, the way one measures them is by their shares of the market from which they come and 40 percent of the very, very large group have to make a powerful showing that economies of scale really justified so large an aggregation. And even if it did, there would be 60 percent of the industry left.

Mr. **Volkmer**. But let's assume there was someone else in office and they did approve it. What remedy would those other people have?

Mr. **Baxter**. Well, by definition if you are going to eliminate private remedies, he would have no remedy.

Mr. **Volkmer**. And he would also have no remedy if after once going through this, Justice found that it was anticompetitive and filed for injunctive relief to stop it, yet the private individuals out here who have been damaged would have no remedy?

Mr. **Baxter**. They would have no damage remedy for the period during which they had operated up until the point of the injunction; that is correct.

Mr. **Volkmer**. And you believe that that is the way it should be—no damage remedy at all?

Mr. **Baxter**. Yes.

Mr. **Volkmer**. Right now, offhand, I disagree with that a little bit.

Yes, Doctor?

Dr. **Merrifield**. Let me point out a couple of facts. One is that the pace of change of technology now is so great that rarely will a product or process have more than a 5- to 10-year life cycle. It is very difficult to understand how anybody can monopolize any area ever again particularly in a world market situation where other nations now are developing technology equivalent to ours. You see the United States with 5 percent of the world's population a decade ago was generating 75 percent of the world's technology. Now our share is down to about 50 percent.

In another decade it will probably be about a third; not because we will generate less, we will be generating more, but the other 95 percent of the population of the Earth will be getting into the R&D game. Technology is the highest priority of almost every nation now because they see technology as the sine qua non of the quality of life.

The point is, we are in an enormously competitive world market. It is almost impossible to see how anybody can dominate for any more than a very short period of time any technology no matter how big a group it is because it will be obsolete and innovated around in a very short period of time.

So I think the apprehensions here are not that significant. We have to get out of our provincial concept of the United States as being the world. It is no longer the world. Particularly any commodity business like steel or aluminum or petrochemicals. There are no barriers to that technology any longer and all sorts of nations are targeting our industries and no individual company in this country, not even IBM, can stand up to a nation that is targeting its industry.

Mr. **Volkmer**. Dr. Merrifield, do I understand you to say that when I look at antitrust provisions or anticompetitiveness or monopolistic or whatever, that I should look worldwide and not in the United States?

Dr. **Merrifield**. Absolutely—in every situation.

Mr. **Volkmer**. But I don't control what happens in those other countries.

Dr. **Merrifield**. Nor do we. And that is why we can't control the world either and we have to consider the rule of reason really is it competitive in a world situation where we are being impacted by technology and strategies that basically we are not allowed to do ourselves because we are playing by rules that nobody else plays by.

Mr. **Volkmer**. If I may, Mr. Chairman, continue this just a little bit further.

Mr. **Walgren**. You may.

Mr. **Volkmer**. What I am hearing you tell me is that it is all right to have one large or small—or whatever it is—corporation in this country develop even R&D usage as long as there are competitors in some other parts of the world and have a monopoly in the country so long as there are competitors in other parts of the world. Is that what you are telling me? Is that right? Is that what you are telling me?

Dr. **Merrifield**. In world markets there is no such thing as a monopoly. That is right. For example, take the automobile business or the steel business or any of these great old businesses. There is no question that we are losing market share and concentrating on becoming less competitive because of our antitrust laws. Ford and General Motors and Chrysler could not even collaborate on the catalytic converter and the seatbelt, let alone in the development of new generations of systems. So we are in a work market willy-nilly that is just a fact of life and in those commodity areas we are now defensive because we can't collaborate on a scale that other people are allowed to do.

Mr. **Volkmer**. Mr. Ewing, would you like to comment on any of this?

Mr. **Ewing**. Yes, sir. Let me make three comments.

First, one of the dangers that Mr. Baxter has pointed out is that if you have all companies in industry putting all of their research and development efforts into one basket, then there is no incentive for them to spend very much or do very much. In fact, that was the case that the Antitrust Division brought against the automakers which resulted in a consent decree agreed to by the automakers under which there were prohibitions against the various engineers of those companies engaging in the previous type of activity.

Contrary to Dr. Merrifield, the Antitrust Division, while I was in it, gave permission under the terms of the consent decree for Chrysler engineers to work with Ford and GM engineers on certain problems. So that even there was an ability to get together under our antitrust laws but without any competitive effects because of some safeguards that were taken.

That is my first point. My second point, sir, would be to say in answer to your first real question to Mr. Baxter, It is a question of a spectrum of incentives here. We can say let the antitrust chief give an absolute immunity that is unreviewable by any court in the land but that is going pretty far. We don't have to go that far, in my judgment in order to create incentives for businessmen to get into R&D joint ventures and to relieve some of the uncertainties. We do need to go so far as to say the businessman who does it isn't subjected to treble damages. But I would prefer to leave the businessman still able to come into court and prove, if he can, that he has been injured under the traditional rule of reason analysis and under traditional antitrust norms. And if he can prove that then he, in my judgment, should be able to obtain single damages with prejudgment interests to make him whole.

I would keep that protection in our antitrust enforcement system because I don't think the record is clear enough today at this point in time that we have to go to the other side of the spectrum and simply allow, if you will, one man in our government bureaucracy to create an unreviewable exemption from our normal rules.

Mr. **Volkmer**. Do you have a comment on the question of whether monopoly is, as I understand Dr. Merrifield, in other words, is it monopolistic so long as there is competition in other parts of the world?

Mr. **Ewing**. I think we have to be very careful in how we analyze that. I think monopolies are still possible. I think they are still to be guarded against in this country as we have guarded against them since 1641. I do, however, think Dr. Merrifield has a point when he says that it is harder now as our technologies overtake other technologies for any monopolist who has only one technology to stay a monopolist very long. I think that is a true point.

Mr. **Volkmer**. Thank you.

Thank you, Mr. Chairman.

Mr. **Walgren**. Thank you, Mr. Volkmer.

Dr. Baruch, would you like to add a quick comment?

Dr. **Baruch**. I did want to add a comment that I think bears on Mr. Baxter's and Dr. Merrifield's comments. For example, I can conceive of a situation where all of the companies in the United States would get together to develop a totally new process of video recording. They, in fact, have zero of the market in the United States and yet, together, they hold all the potential market but they would be competing with foreign competitors.

I would also like to add to what you are saying, though, that the aggressive control of monopoly, particularly in an industry where there is a positive return to scale is absolutely critical if we are going to have innovation. Economists can demonstrate that a completely fragmented industry wouldn't be innovative. Similarly, we can demonstrate that in a positive return to scale industry where you have one monopolistic leader, you wouldn't get innovation because there is no incentive for it.

Maximum innovation seems to take place in an industry structure that has a leader and a leader that is restrained by antitrust and second, third tier competitors.

As a matter of fact, it has gotten so common that in the study of innovation, it has come to be called the Avis syndrome where you have an enormous incentive on the part of the second best because the positive return to scale gives him a monopoly position vis-a-vis the first one and you get this seesawing back and forth which causes tremendous rates of innovation.

I would like to see our antitrust laws be sufficiently aggressive to permit that kind of industry structure without trying to drive us all the way of a fragmented industry or permitting a monopolistic one at the front.

Mr. **Walgren**. Thank you.

Mrs. Schneider

Mrs. **Schneider**. I regret that I have two other hearings going on simultaneously and I was not able to hear the testimony of each of you. However, I will venture to ask a question which I asked the panel yesterday that came to testify and please forgive me if you have already answered this question, but I would like to hear it with my own ears.

One of my greatest frustrations as a member of the Science and Technology Committee is recognizing that we have a vast array of very innovative and useful technologies that are available now for consumption and it is very frustrating to me to see that, for example, I will give you the specific example, in the area of my constituents not being informed or aware of the technology being available. I have a number of manufacturing plants in my district who are on the verge of going under, some of whom have already gone under and their main culprit that they point to are the high energy costs when in fact I have toured those factories and said, "Look, if you made this change or if you had this technology or if you would recycle your waste steam heat and did this, this and this, you could save enormous numbers of dollars," and they are just not aware of these technologies being available.

So I think that you were commenting earlier about technology transfer beyond the borders of the United States. I am anxious to hear what kind of game plan exists to get information to the masses here.

Dr. **Baruch**. Congresswoman Schneider, I did talk about diffusion which I think is what you are interested in; how do you get the knowledge to where the action will be. My experience in that area is in Rhode Island which I am sure you are familiar with.

Mrs. **Schneider**. Very.

Dr. **Baruch**. Where we had a concern early on when I was working with the National Bureau of Standards. There was a concern for waste disposal in the jewelry industry.

We still have that concern and what we tried to help them do was recognize a set of technologies that would permit them to aggregate their waste into a common transfer.

There are many technologies that exist. There are many new ones that are being brought into existence and there are many that exist overseas, not just in waste heat utilization or waste disposal but in things like electroplating technology. There is a whole new area of electroplating technology which has come about which is of critical importance in your area.

My sense is that we do not have a U.S. structure similar to the old Agriculture Extension Service to work in industry. And the reason for that is simple: Farms don't compete with each other. If your farm gets better and my farm gets better, we both make out better. But companies do compete with each other. Until you get far back enough in that diagram, the basic technologies like waste treatment systems, the basic technologies, then they don't compete and that is why I am hoping that the national technology foundation will have as part of it the kind of extension service that will serve to diffuse the new technology the way the Agricultural Extension Service did in our most productive years in agriculture.

Mrs. **Schneider**. That was the party that you were looking toward to solve that problem.

Dr. **Baruch**. I would urge support of that concept as hard as I can.

Mrs. **Schneider**. Dr. Merrifield, Mr. Baxter, do you have any comments on diffusion?

Dr. **Merrifield**. Well, this is a major concern to us and one of the things we are trying to do through the National Technical Information Service and our center for utilization for Federal technology is to aggregate information like this that has been developed in Government laboratories into portfolio-managed systems that will be relative to the industry or whatever.

The other side of the coin is to help these people, in fact the Providence, R.I., plating people have a problem there obviously and the answer to that problem has existed for about 10 years now in Detroit to develop a reverse osmosis technology.

Part of the solution to the problem is to set up a research and development limited partnership that will develop that technology and utilize it. That is another aspect of what we are trying to do.

Mrs. **Schneider**. I have only been in office 2½ years now, but I certainly seek the cooperation of all of you experts in solving that problem. I don't want to wait another 10 years to deal with it. So I am working on it and I solicit your assistance.

Yes, Mr. Baxter?

Mr. **Baxter**. This comes back to a point I tried to make a while back. These technologies are all invented by someone and all of them are patentable but these early technologies that have applications in a wide variety of industries, you cannot build a company around them. The only way they can be exploited is through licensing but the present state of the law is such that licensing is a highly risky activity.

Now, if the technology or any particular technology you were talking about was proprietary, if someone could treat it as a product, there would be someone in Rhode Island attempting to promote it, to explain it, to sell it, to get people to take licenses under it but we have so damaged the process of licensing intellectual property in the United States, particularly when it takes the form of rather abstract processes as opposed to tangible products that we are seriously deficient in that regard.

Attention to this licensing problem would also go a long way toward curing that asserted gap in that pipeline because the difficulty there is precisely that. It is difficult at the more abstract levels and I am talking all the way back to basic research now, but at least more abstract levels to successfully patent, make proprietary and license because of these restrictions that the antitrust laws have built around the licensing process.

Mrs. **Schneider**. Thank you.

I have one other question, if I may continue. I wonder to what degree you gentlemen in your various capacities look at the whole question of high-tech versus low-tech solutions to our problems? It concerns me a great deal that so often now we seem to be focusing a great many of our dollars and a great deal of our thought on high technology solutions when, in fact, we are ignoring some very obvious simple solutions. I guess one of the first things that comes to my own mind is the emphasis on improving construction of buildings. And if we look back toward our Founding Fathers, passive solar was certainly a design that was in broad usage and now we are using, of course, some of the more high-tech approaches to solar power.

There are many other examples of that type of thing, mechanical solutions that are much more simplistic and don't require micro chips and other such things. Do you feel that there is a particular bias in your review of science and technology solutions?

Dr. BARUCH. There again, if I can speak as an old dirty fingernails engineer who just recently came to micro chips, we don't see the distinction between high-tech and low-tech industries. We do see things like the steel industry which, if you define it as being an industry to make steel is in trouble because everybody can make steel.

If you define it as an industry to make structural elements then there is some question and I have got to give Dr. Merrifield credit for this. We were over in China together and China was about to build a cold roll steel plant to make sheet steel for refrigerators and automobiles and Dr. Merrifield said, "Why steel?" I said, "You always make refrigerators and automobiles out of steel." He says, "You do in a country like the United States, but wouldn't glass fiber-enforced plastics be more appropriate to the Chinese scale of labor and materials?"

I don't know if Bruce knows about this, but the Chinese have built a large glass reinforced plastic plant and they are now building refrigerators that way because it makes more sense for them.

Does our steel industry or our structural element industry, should it be looking at rapidly solidified metals, boron nitride reinforced concrete or glass-reinforced concrete, a whole set of new materials that would perhaps leave us out of trouble because they require techniques that other countries can't copy easily and they are also advanced enough so that they produce benefits that just plain steel doesn't.

So I think we make a mistake when we define an industry too narrowly by what it produces rather than by the service it performs.

Mrs. SCHNEIDER. Thank you. I appreciate that clarification.

My final question to Mr. Baxter and Dr. Merrifield. The administration, I understand, has taken on this initiative with the Government seeking injunctive relief against joint ventures, but the venture was in violation of antitrust laws. I wonder if you believe it is enough to lower and not eliminate the damages against any violating venture?

Mr. BAXTER. Well, it obviously would be an improvement. I don't think it is enough. It is the opportunity to bring litigation in many senses and to impose costs on competitors and to slow competitors down while you catch up that are among the most damaging features. Litigation will be brought merely to delay if there are private remedies available in this particular area and I am not sure that we are going to see significantly greater innovation of the joint approaches if we leave private remedies but certainly a reduction to a single damage remedy with compound interest and so on as Mr. Ewing suggested a minute ago and if that remedy is invoked unsuccessfully, the defendants are able to recover their own costs and attorney's fees would represent a very significant improvement.

Mrs. **SCHNEIDER**. Is it fair to say that the original problem, perhaps, is a lack of clarity and that there is still a strong need to provide clear standards to high tech industries on what are appropriate antitrust guidelines for joint ventures?

Mr. **BAXTER**. Well, we talked about this a good bit before you came. I think there is a perceptual problem there. I think there is a widespread notion that the antitrust laws get in the way of joint ventures to a much greater extent than they do. But I also think there is a very, very legitimate concern about competitors misusing antitrust remedies when your joint venture has successfully produced something trying to be let in on the game at that very late point in time.

Mrs. **SCHNEIDER**. Very fine.

Yes, Dr. Merrifield?

Dr. **MERRIFIELD**. One additional comment.

The diversity of those operations is so incredible now that it is very difficult to anticipate in any set of restrictions what the possible permutations of all those variables might be. The fewer they are, I think the better. The more they are, the more intervention of the bureaucratic process will be necessary, the more the delays, the more encumbered and the more difficult it will be to do those things so I think we ought to try to err on the mineral side if possible.

Mrs. **SCHNEIDER**. OK. Thank you very much.

Thank you, Mr. Chairman.

Mr. **WALGREN**. Thank you, Mrs. Schneider.

Doesn't the diversity that is apparently in this area make it very difficult to define markets and market share and therefore to rely on a certification process that would eliminate by bureaucratic review any recourse to antitrust pressures? Could I address that to Mr. Baxter?

Mr. **BAXTER**. There may be such difficulties there, it is true. There will be in some cases. In other cases, it will be relatively simple to say what the relevant market is but whatever the difficulties are, they will be present whether in private litigation or in Government litigation. And to the extent there are these complexities and difficulties and uncertainties, the more fertile private litigation is as a device simply to slow down once competitors, interfere with their operation that now appears to be a successful one while you attempt to catch up yourself or to shoot your way into their game.

Mr. **WALGREN**. Most of us are relatively uncomfortable with bureaucratic decisionmaking and would be reluctant to see major economic decisions or decisions of great implications for industries or for individual small companies be able to be made within a bureaucracy that they can't really oftentimes get at.

In view of the fact that it would be very difficult to define the market and you say, well, look, 15 percent doesn't bother you, but that really depends on the definition of the market and another definition of that market which you may be not sensitive to or the reviewer may not be sensitive to may be what is the reality and therefore we would get very wrong decisions at that point out of a Government bureaucracy with very little ability to review it.

Isn't there some potential in perhaps some short form judicial reviews that might be more accessible to the individual case?

Mr. BAXTER. Well, it isn't as if there were some magical crystal ball to which you could go as an alternative to what you described as bureaucratic decisionmaking. The alternative is to have the matter settled between two private parties who have obvious strong vested interests who will litigate the matter before a jury. And now these complex technical questions to which you refer will be decided rightly or wrongly by a jury.

Mr. WALGREN. Don't we have the ability, though, to restructure the recourse to the courts and I don't know what you would want to build into it, but there must be a way to have the kinds of qualities that I associate with a judicial review brought to bear which involves the ability to make comprehensive presentations with a careful listener and a careful reviewer that is more independent than I instinctively assign independence to what we commonly think of as the Government bureaucracy.

Wouldn't it be possible to set up some forums like that that might walk this line a little bit better if we feel that we are giving up something substantial by going to no private remedies?

Mr. BAXTER. Well, it depends entirely on your attitude to alternative forms of revolution mechanisms. Obviously the certification process is contemplated in some of these measures could be made subject to judicial review. Then the question arises, well, what kind of judicial review do you want? Do you want that to be a de novo review in a district court? The probable answer to that and the one that seems to be contemplated by some of the pending bills, although they are not clear on the matter, is that they don't contemplate de novo review. They contemplate an appellate-type review in a court of appeals. But of course an appellate-type review contemplates that a record has been made somewhere or another which could be reviewed. And again, although the bills are not clear, what they really seem to contemplate and what they would force us into is the holding of trial-type hearings and APA-type procedures within the Justice Department that are turning the Justice Department into an administrative agency which would then be subject to an appellate type of judicial review on the basis of a record made in the Justice Department.

I don't know if that gives you a feeling of additional security or not. It is still quite consistent with the elimination of private remedies, although, of course, the private parties could conceivably come in as affected parties in the appellate type of review still without anything in the present form of a private remedy where they would be the initiator of the action.

Mr. WALGREN. Let me ask, the approach apparently is that some of the suggestions are overburdensome in their regulatory aspects. How many detailed cases of evaluation and prosecution could the Justice Department handle in this area? And if you had a multitude of them, what could be more overburdensome at least of our limited governmental resources and to the degree that they could get to the cases, overburdensome of the system and inhibiting on the private sector.

It would strike me that when we move away from private remedies we really are concentrating all our reliance, obviously, on the governmental side, and if we are worrying about the Government being burdensome might that be 10 times more burdensome than we are moving away from by trying to jettison the private remedies?

Mr. **Baxter**. Well, of course, in any meaningful sense of the term burdensome, there is nothing in the world that approximates or approaches in its burdensomeness private antitrust litigation. It imposes enormous expenses and enormous diversions of management time and attention on the parties so that the burdens are entirely proportionate to the number of troublesome and disputed instances are not very directly related to where those disputes get resolved.

In the approach to the situation which we have outlined, there would be fairly detailed filings with us which would be made public. People who were concerned could come in and talk about whatever their concerns were, but the overwhelming preponderance of those filings, no one can say in advance exactly whether we are talking about 80 percent or 90 percent, but some very large fraction one could tell after brief inspection posed no competitive problems whatsoever and the extent of the resources that would have to be devoted to them would be quite small.

Others would require major investigations and the burden would be whatever the burden is. But the burden most certainly will be vastly less if they can be approached in that way with some being disposed of on the basis of 40 or 50 or 60 manhours of time with lawyers and economists and only some very small number receiving thousands of manhours. Then if we are required to facilitate a process of judicial review to conduct a trial-type hearing with witnesses and making a written record with respect to all of those cases and that is essentially what the certification process will require.

Mr. **Walgren**. Does this go back to Mr. Gore's point that we really have no data to base what we are walking into on this?

Mr. **Baxter**. We have very little by way of data.

Mr. **Walgren**. Let me ask the other gentlemen if they would like to respond.

Dr. Baruch?

Dr. **Baruch**. I would like to take the liberty of responding as a technical person rather than as a legal one since I am not. One of the assumptions that we have been making in all these hearings when we eliminate the third-party intervention private suit is that somebody is going to be able to judge, a prior, in a research partnership, research combination what industry is going to be primarily affected by that research. We can't do that.

It never occurred to anybody when people were working on solid-state semiconductors integrated circuits that the machine tool industry was going to be affected in a major way by those developments. And it is my feeling that we have to allow room for bureaucratic error and bureaucratic mistake and bureaucratic misidentification of the competitive structure that is going to result from the research. And that can only be done, I think, by allowing for the kind of private intervention that can take place before, during, and after the completion of the development work. And so I would like to urge extreme caution about logic people out of subsequent involvement in deciding whether they have been damaged or not.

Mr. WALGREN. Mr. Ewing?

Mr. EWING. I would like to echo Dr. Baruch's comment by making two of my own. First, it is not the initial creation of the joint venture that is the troublesome aspect. It is the result of the venture. It is when the venture is successful the technology of that venture goes into the field in one way or another that the competitive effects can be seen. So there is going to be a time lag in most cases before somebody is affected.

At that point you are going to have extreme pressures, it seems to me under the certification approach on the Justice Department to reopen a hearing and go through and hear from the private parties that are affected.

Mr. WALGREN. Let me ask, though, and I have no feel for this, whether our concerns in the competitive area are solely with the result of great advantage given or do we see a very valuable contribution of present competition regardless of its success in delivering financial value because we really don't know what we are missing if we miss that competition. And to the degree that we feel comfortable sitting back and waiting to see the results we have not benefited as a society from the competition between the cracks.

Mr. EWING. I would agree with you on that and I think Mr. Baxter wants to comment on it. Let me go forward just for the subject of data which you raised, sir. Professors Berg, Duncan, and Freidman last year published a work on joint venture strategies and corporate innovation. They analyzed some 650 joint ventures that had been entered into by 950 companies in the years 1965 through 1973. Now, not all of those joint ventures were research and development joint ventures, but they were joint ventures.

If most of those companies had been able to get an antitrust exemption by a simple filing, we might well have seen something approaching 650 filings. That would be roughly 85 a year and that is beyond, I believe, the capabilities of presently structured antitrust division to deal with. Even if you cut half of those out, that is still an enormous number of cases to be dealt with each year on a certification basis.

So I think that really when Mr. Baxter and all of us talk about the regulatory system being a tremendous work load, I think it is real. Up until now there hasn't been an incentive on the part of the companies to come and ask the Justice Department because Justice couldn't give them a binding exemption or immunity.

I would also, sir, respond to your last point, and point out that we never know when ventures are not engaged in, what we are losing by way of the technologies that might have been created and diffused. The tradeoff, of course, is that we don't know once they combine what they might have produced independently and we are having to do some guess work here in terms of public policy incentives.

Mr. WALGREN. It is true, in general we bet on competition rather than combines but I suppose that goes back to the point that there may be a critical mass here that we are missing.

Mr. EWING. Some of us who believe most strongly in competition also at this point are beginning to believe that technology has to be looked at independently and we had better start betting on the mechanisms to create new technologies by which our firms can compete.

Mr. **Walgren**. Mr. Merrifield?

Let's turn first to Mr. Baxter and then Dr. Merrifield.

Mr. **Baxter**. Now we have seriously gotten off the track in several of these last suggestions and I want to talk about what the nature of the competitive problem is here. It is perfectly true that if a venture is successful, it will have important competitive consequences. It will not have anticompetitive consequences when it is successful. Somebody will have a new technology. They will be in a favored position in some industries. They will make substantial profits and of course that is exactly what is supposed to happen.

It is not against the success of the venture that we intend to guard when we talk about antitrust problems being raised.

The anticompetitive problems with R&D joint ventures lie not in the possible success of the ventures displacing other companies but rather in two aspects of activity. One is the loss of competition in the process of innovation in the industry. If too many of the companies in the industry are in the same joint venture, one loses rivalry in the process of innovation and we should always desire to preserve rivalry in the process of innovation. We should be shooting to have five or six or seven joint ventures in industries, not one or two. That is one of the competitive problems.

The other competitive problem that arises is if in a tightly structured industry where there are only 6, 8, 10 firms, if a large fraction of them get in one of these groups, the opportunity for them constantly to be in touch with one another to communicate with one another may facilitate anticompetitive collusion today and quite without regard to the success or failure of the venture, back in the marketing and distribution in which those companies currently compete in their own markets.

When we talk about anticompetitive problems associated with joint ventures, it is those two types of risks that we should be focusing on. To suggest that the success of the venture whereby it subsequently enjoys success in some yet-to-be-formed industry is of a complete misconception of what the problem is. That is not a problem. That is to be welcomed and accordingly one does not have to look forward to the possible breakthroughs here in order to determine the relevant markets.

The relevant markets are the research activity market which is identified in the filing and the market in which the companies are currently competing in production and distribution, not the industries to which the breakthrough will be applicable.

Dr. **Merrifield**. I would like to make a comment picking up what Bill is saying.

Let's use a specific example, the four megabit chip. The key to that will be the manufacturing system that will custom make it to 100 different architectural designs and that will stimulate an incredible degree of new innovation and the use of that chip for all sorts of applications and computers and numerically controlled machine tools and so forth.

The point is that these are self-limiting situations. There is no such thing as zero risks of course, but these are self-limiting. The people that are going to collaborate in a development like that are looking for a component that will give them tremendous advantages in design and structure of new systems that are now not possible and it will stimulate an incredible degree of new innovation and the only noncompetitive aspect of it will be that process, that flexible manufacturing process that makes those chips, and to many, many different designs. And it might inhibit the further development of new, more process technology on that type of technology but then comes the juncture and other devices that achieve the same thing, the systems that are even potentially better than the four megabit chip would be and the silicon or the gallium arsenide chip.

So the innovation goes on but it comes in from a different door. It is hard to envision how this process ultimately can have any significant consequences. If it does, there is plenty of time now to require broad licensing of the technology or whatever else it takes to stimulate it.

Mr. **Walgren**. Dr. Baruch.

Dr. **Baruch**. That question of broad licensing was just the question that I was concerned with with Mr. Baxter's proposal and it goes something like this: If I have a company that has 75 percent of the market and it has some powerful new inventions—I guess all inventions are new—it has some powerful inventions, it will in general be encouraged if not forced to license those so that it doesn't get an unconscionable degree of the market.

Now if I have three companies that only have 5 percent of the market and they join together under an exemption from antitrust, and they develop a new technology that lets them each pick up 25 percent of the market instead of five. So now together they have 75. They now have an exemption from antitrust that that first company didn't have. Does that exemption from antitrust prevent them from being forced by third-party suit to share that invention as any other monopolist group would be forced to share it. And if so, then I think we are in an area of danger where the results of the research is the question and not just the formation.

Mr. **Walgren**. Well, we have gone on in time and used a lot of your time and we appreciate that.

I would like to ask perhaps Mr. Baxter—there was one thing I wanted to give you a chance to elaborate on and it was this damage that the antitrust laws have done in particular to intellectual property and the licensing that you touched on. I don't understand that. I wouldn't have the background to understand it, but I think it would be helpful if you could develop that a little bit for the record or perhaps send it in or I could ask, if you would like to elaborate on that now, the recorder to keep going and when you stop, the panel will stop because I have to go.

Mr. **Baxter**. I think it is probably better if we send you a letter, Mr. Chairman.

[The information had not been received at the time of printing.]

Mr. **Walgren**. Well, I am curious on that particular point.

Thank you very much for your time. I will be right back. There is a vote over there and it won't take me very long and we will do the second panel right then and perhaps I should suggest that the third panel get a sandwich because we will keep on going and try to complete this hearing by early afternoon. So I will be right back.

[Brief recess.]

Mr. WALGREN. I apologize for the interruption and the time but it is an interesting subject and when the subjects are interesting it pays to spend the time.

The second panel, Dr. James Mathis, vice president of Science and Technology with Exxon, who is the chairman of the Chemical Industry Institute of Toxicology.

And you are accompanied by——

Dr. MATHIS. I am accompanied by Milton Wessel, who is the General Counsel for CIIT.

Mr. WALGREN. Welcome. Please proceed and as I say your written statement will be made a part of the record and please summarize or communicate as you feel most effective.

STATEMENT OF DR. JAMES MATHIS, VICE PRESIDENT OF SCIENCE AND TECHNOLOGY, EXXON, AND CHAIRMAN, CHEMICAL INDUSTRY INSTITUTE ON TOXICOLOGY, ACCOMPANIED BY MILTON WESSEL, GENERAL COUNSEL, CHEMICAL INDUSTRY INSTITUTE ON TOXICOLOGY

Dr. MATHIS. I would like very much to do that.

The first point I would like to make is that I am an engineer and not an attorney, so the comments I will have for you and for the subcommittee really have to be couched in that guise.

But I do believe CIIT has some experience which might be useful to the committee in its current deliberations.

The second point is that I really don't intend today to bring you any thoughts about the specific proposals that you have been considering but more to describe in brief detail exactly what CIIT is and how it has managed to organize itself with full consideration of these antitrust issues.

So let me just do that briefly.

CIIT is an organization devoted to the investigation of the toxicological effects of chemicals. It is supported by the chemical industry and at present there are 33 members. And if you were to take the chemical sales that are produced by these members and users you would find that we are representing something like three-fourths of the total volume of the chemical industry in the United States.

So we started out with the thought that we would pay extremely close attention to the problems that might be associated with the grouping of that much of the chemical industry in any kind of an endeavor and I think we have accomplished that very effectively.

Now, let me just tell you a bit about CIIT and how it operates.

The first thing we have agreed to test the toxic effects of commodity or building block chemicals which are common to the industry. That is not to say that every one of the members will make all these chemicals. In fact, that is not the case at all.

The purpose of our testing this is to produce information which will produce a better understanding of the mechanisms and the causes of toxicity and it will also allow us to have an input into the overall process of risk evaluation for human beings that might be subject to these chemicals.

Another objective of the organization is that we wish very much to increase the capability of the society as a whole to cope with these toxic questions. So we do quite a bit of training of people in this area.

Now CIIT started out in 1974 as an idea and in 1975 it was actually chartered. We sought an opinion from the Justice Department, a business review and got one. It is part of the submission which I have given to you.

The group has developed very, very effectively since then. We now have 106 research personnel. The staff, including the president of CIIT, is totally separate from the CIIT membership, the member companies. These are actual full-time employees of the Institute whereas the member companies serve on the board of directors and its advisory committee.

The policy in CIIT is set by the board.

You already recognized I am a person from Exxon. I might just mention that our vice president is Dr. Blair who is Dow's vice president for health and toxicology and environmental science and our treasurer is Mr. Wayne Jaeschke who holds a similar position in Stauffer Chemical Co.

We also have nonchemical people on the board. For example there are Dr. Lederberg, a Nobel laureate in biochemistry and president of Rockefeller University, and Dr. Higginson, an epidemiologist distinguished in the field of toxicology.

Our research facilities in the Triangle Park cost $15 million and the operating budget is approximately $10 million annually. It is funded by the membership on a dues basis based on sales, and dues might range from as little as $30,000 per year per company to as much as nearly $800,000 per year per company, so it is a massive commitment on the part of any particular one company.

Now we have done a lot but I am not going to take the time to document all of the activity. CIIT, just to give you the primary example that has gotten us public recognition, was the first scientific organization to discover that formladehyde is a weak carcinogen in certain animals. In addition to this we have done work on many other commodity chemicals which have also yielded very valuable results.

Now I would like to get into the question of our antitrust considerations. The success that I have tried to describe certainly works to all the members' advantage and there is no question about this. But just in the same sense that people that might support a hospital or a university would share in the value of the hospital or the university's activities, but we have no short-term competitive objective. Our objective is really to produce toxicological information which will help society protect itself against whatever risks might be associated with chemicals.

I think the most significant problem that we have faced and have overcome in the antitrust area has to do with the divulgence of information. You can see that if information that a particular material might have toxic effects were only available to the companies that were in the consortium this could create some advantage over other companies who might make the same material but not be involved in the consortium.

So we have developed a policy which works as follows: The detailed information on what is going on in the various tests and research is known only to the CIIT staff, the internal staff. Plus selected other consultants for which I will describe the arrangements in just a moment.

Now the staff has been given direction by the board of directors that as soon as any kind of finding occurs which is considered significant in the staff's opinion and the opinion of the president of CIIT, then that information must be released immediately and publicly without prior divulgence to any of the member companies.

So it is actually true that the EPA and many governmental agencies in the world at large will know, say, about the formaldehyde finding as soon as the member companies in CIIT that make formaldehyde. And you might see this could create some interesting kind of tensions within the organization.

Now, another point is that CIIT member company scientists occasionally serve in a consultive role with CIIT. These might be company toxicologists who have special expertise in a particular area of scientific research that we are undertaking at that point in time. CITT signs these people up ahead of time to preserve the separation between their company activities and their CIIT activities. They will sign a document in which they agree to maintain in strict CIIT confidence the CIIT information that they have available under this consultive arrangement.

If they feel because of legal or other pressures on them that they must divulge it either to the world or within their company, then they are obligated to inform CIIT management of that so that CIIT management can decide at that point in time whether to divulge the information fully.

And I might say then there are other areas of possible antitrust significance in CIIT's operation.

For example, the choice of which chemical to study is a good example of that and here we have set up a rule of reason type guidelines of the kinds of criteria that we might want to apply to select a chemical to be studied. And on top of that we have involved a scientific advisory panel of distinguished scientists, really the topnotch people in the toxicological field, to advise us on which of these things that we might want to do and to advise us on the research.

Now, there are many other of these kind of things that I could mention but let me just say that I think the end result of all this has been that CIIT has developed an outstanding reputation for credibility and for scientific correctness. And our scientists are sought by many other panels and many other activities such as governmental agencies and such as the Society of Toxicology and what have you to contribute their scientific input.

The companies who support CIIT are very, very proud and pleased to be a part of an activity in which we are funding a true scientific approach to understanding the toxicity of these chemicals. And I think we have done it in the ways I have described so that we really are able to fund it and to manage it in such a way that it is to the benefit of society and not to the individual companies.

While we have had our problems and I don't want to gloss over the problems, the big problem has been that the chemical industry has been in the worst possible recession that it has faced, I suppose since the 1930's. And so membership commitment has lagged and we have lost a few members.

On the other hand we have gained a few members so on balance we maintained our position within the industry. And we would like to see all of the companies within the industry become members of CIIT simply because we think this is a very significant advantage for the industry to have in terms of public position.

Well, I guess all I can say about it in conclusion is that this is persuasive evidence to you I hope that a joint effort can be structured and operated under the current antitrust laws in such a way that society does benefit and that for the most part there are no problems. And that is really a very quick résumé of what I had to say.

[The prepared statement of Dr. Mathis follows:]

98 th Congress, First Session
Committee on Science and Technology
Subcommittee on Investigations and Oversight

Hearings on Japanese Technological Advances
and Possible United States Responses
Using Research Joint Ventures

Statement
of
J. F. Mathis, Ph.D.

I am Chairman of The Chemical Industry Institute of Toxicology, and I appear before you today representing that institution. The Chemistry Industry Institute of Toxicology, commonly called "CIIT", is an unusual and perhaps unique industry joint research venture. It seeks to improve the ways in which we cope with two critical problems confronting society.

The first problem is dealing with the inevitable negative side effects of technological advance, in this case advance through chemistry. CIIT seeks to do this by testing the toxic effects of the basic or "commodity" or "building block" chemicals, by developing through research a better understanding of the causes and mechanisms of toxicity, and by increasing our human and scientific capability to conduct such work.

The second problem is resolving the disputes which result from conflict between the positive and negative effects of chemical products. Here CIIT seeks to help by providing a valid and credible industry scientific input into the dispute-resolution process. I include "credible" as well as "valid", because so much of what CIIT treats is esoteric science, far beyond the understanding of the layperson in a legislature, an administrative agency, the judiciary, or the public. Credibility is therefore critical to acceptance of its products.

Some of what CIIT does, such as developing greater scientific expertise through education and training, might be characterized as partly responsive to foreign technological advances in Japan, the specific subject of this hearing. But CIIT's effort to better understand the mechanisms of toxicity, to discover improved testing and epidemiological methods, to assess human risk more accurately and to provide an input into societal risk/benefit balancing of chemical usage, recognizes no geographic borders. It should not be an aspect of a contest at all, but a joint effort worldwide, to which each nation contributes what it can. Any race with the Japanese in this area should be only to see who can first and best serve humanity.

CIIT Operations

CIIT is a scientific research membership corporation located in Research Triangle Park, North Carolina. It is supported by thirty-three companies which make or use chemicals. Its present members collectively produce about three-fourths of the sales volume of the U.S. chemical industry.

CIIT has a full-time staff of 106 research scientists and support personnel. Its scientific work is divided into Departments of General and Biochemical Toxicology, Genetic Toxicology, Pathology, Cell Biology and Epidemiology. The staff is as separate from the CIIT membership as it would be in a hospital, a university, or a religious institution.

CIIT policy is set by its Board of Directors. Most directors are employed by member companies. For example, I am EXXON Vice President for Science and Technology. CIIT Vice-Chairman, Dr. Etcyl H. Blair is Dow's Vice President, Health and Environmental Sciences, and Treasurer Wayne C. Jaeschke is Stauffer Vice President, Environmental Services. CIIT has three nonmember employed directors: Dr. Robert A. Neal, CIIT President, one of our nation's leading toxicologists; Dr. Joshua Lederberg, a Nobel Laureate in biochemistry and President of Rockefeller University; and Dr. John Higginson, a distinguished epidemiologist who is Senior Scientist at Universities Associated for Research and Education in Pathology.

CIIT's research facilities were completed in 1980. Its toxicological testing facilities and instrumentation are "state of the art", and among the finest in the world today. It can handle large animal as well as rodent testing, has analytical capabilities below the parts per trillion level, and control mechanisms which insure the highest quality output at minimum risk to personnel.

CIIT's research facilities cost $15 million. Its operating budget is approximately $10 million annually. It is funded by its membership, with annual dues (based on sales volume) ranging from $33,000 to about $800,000. Each member also commits to a rolling three-year forward dues schedule to provide an element of financial continuity to support of the research program.

At any given time, CIIT has testing programs underway with regard to several of the most important commodity chemicals. These programs are important in themselves, in that they enlarge our knowledge of the toxicity of these building block compounds. But they are even more significant as integral parts of CIIT's overall effort to understand toxicity, to improve research and testing techniques and to develop more and finer scientists who will further expand our knowledge in all of these areas. CIIT is thus really a "seed" research institution, the effect of which should be multiplied many times over.

Exhibit "A" attached is CIIT's latest Annual Report, summarizing its operations. Exhibit "B" describes CIIT's current detailed scientific research program.

CIIT Achievements

Progress in toxicology research takes a very long time. Even relatively routine rodent testing can take years to complete; efforts to discover the causes of cancer have already taken generations. CIIT was only first proposed in 1974. Before the critical long-term research and testing could begin, it took much time to structure CIIT's program, to obtain the support and membership of aggressive and sometimes suspicious competitors not accustomed to joint efforts of this kind, to raise the substantial funds needed during periods of serious inflation and then recession, to seek out and employ first-quality scientists in disciplines where shortages have been endemic, and to design and build a unique research facility.

Yet CIIT has already made substantial scientific progress. Perhaps most publicly important, it was the first to develop and publish information that formaldehyde is a weak carcinogen in certain rodent species. Its scientists have published over 450 other scientific peer-reviewed papers, none so dramatic in public perception as the work regarding formaldehyde, but all contributing to understanding in toxicology and related sciences. Its scientists have delivered a sizeable fraction of the papers at the recent annual meetings of the Society of Toxicology. In addition to sponsoring numerous workshops, symposia and seminars, it has conducted 6 major toxicology conferences, as follows:

- The toxicity of formaldehyde
- Testing for carconigens and mutagens
- Animal testing for toxicity
- Structure-activity relationships in toxicology
- The toxicity of nitro aromatics
- The value of rodent liver tumors as predictors of cancer in man

Thus far CIIT has appointed 44 post-doctoral fellows, all of whom have been trained in CIIT's laboratories by CIIT scientists. 28 have graduated and are now serving in government, academe and industry research facilities. It has supported 16 pre-doctoral candidates. Its staff holds 15 adjunct teaching positions at Duke, North Carolina State and the University of North Carolina, in the Research Triangle area. Its scientists also hold positions with the U.S. Environmental Protection Agency, the National Institutes of Health, and the World Health Organization.

Antitrust

I am an engineer, not an attorney. I profess no expertise in the antitrust issues being considered by this committee. With that caveat, it might be useful for me to describe some of what CIIT does in an effort to limit possible anti-competitive impact from CIIT activities. This could be of value to the committee in its deliberations.

CIIT's success surely works to the advantage of its membership in the sense that those who support a hospital or university benefit from its success. But CIIT has no short-term competitive objective as such. Its program was developed from the outset with a deliberate view to avoiding any competitive advantage which might result from membership. It was described in CIIT's application for a Business Review Letter from the Justice Department. Exhibits "C" and "D" are the application and Justice Letter.

Perhaps most significant in this connection is CIIT's policy that scientific research of potential competitive significance must be held either completely confidential, and disclosed only internally within CIIT, or made uniformly public to all. CIIT's President, who is an eminent toxicologist and an employee of the Institute, decides with advice from his scientific staff at what point significant findings have been made. At that point he has been instructed by Board Policy to release the information publicly as soon as possible. Thus CIIT members are not furnished advance notice of information which might be commercially useful. In implementation of this policy, CIIT publishes its research plans, progress and findings widely to government, industry, academe, and the media. All this is furnished even to those who do not support CIIT, an irritant on occasion, but again no different than the service a hospital or university provides even to those who will not support it.

Some CIIT member-company scientists serve CIIT on advisory committees and on special scientific assignments. Sometimes it is desirable that confidential CIIT information be disclosed to them, in order to permit a more informed CIIT decision. Here the policy is for the member-company employee to carefully distinguish between the two "hats" in which he or she serves, one for CIIT and one for the member company. If the information cannot be maintained in strict CIIT confidence, the employee is required to disclose that fact in advance, so that the CIIT President may disclose it broadly, if in his judgement this is appropriate, or take other action.

Of course, there are many other areas of possible competitive impact of CIIT activities. The choice of which chemicals to study, for example, has been placed on as independent, objective and quantifiable a basis as possible, to avoid any competitive advantage which might result from testing selection. An independent Science Advisory Board, made up of distinguished scientists from government, academe and even nonmember companies, oversees CIIT's research program and operations, and interacts with the CIIT staff and the Board of Directors. It too helps assure that CIIT's research work serves society and not any special interest. However, as new problems are perceived, new policies are developed. All are published in CIIT's Legal and Policy Guidelines. Exhibit "E" is the latest version.

Credibility

CIIT is a scientific research institution, not an adversarial advocate. Its policy is to maintain the integrity and credibility of this institutional mandate. Should it become involved in the bitter environmental controversies to which much of its research work is relevant, it is determined to try to act as a scientific expert witness, sworn to tell the truth, the whole truth, and nothing but the truth, and not to be an advocate charged with doing his best for a client.

CIIT Policy Guidelines 8 was developed in response to CIIT's first request to furnish expert assistance and testimony in a contested environmental litigation. Before any such assistance is furnished voluntarily, CIIT's President is required to make a determination that the societal benefits of CIIT participation outweigh any negative impact on CIIT's scientific mission. Where he does so, CIIT scientists may appear and testify, but without fee or even reimbursement for travel expense. All parties, and the court, must be notified promptly of the anticipated expert advice and assignment, given access to all documents seen by any party, and afforded equal opportunity to confer and consult. No party is permitted advantage through surprise, non-disclosure, or withholding of information.

Conclusion

CIIT has its problems, of course. The serious chemical industry recession in these past two years has created the same strains for CIIT that it has for its member companies. Not every major chemical industry company supports it, but effort to enlist these residual companies continue.

But the fact is that CIIT has been extremely successful. It has established itself as a credible industry scientific research effort and produced valuable results. It is called on for advice by government, academe and citizen groups, as well as by industry. This is all persuasive evidence that joint effort can produce important benefits for our nation and our society. It is also impressive evidence that such an effort can be organized and managed in a way that complies in fact and spirit with existing antitrust laws. While the CIIT experience neither proves nor suggests other more commercially oriented joint research ventures could operate under existing laws, it is encouraging to note that one joint effort exists and is progressing.

(Note: Exhibits B, C, and E are voluminous. Copies are available on request from Dr. D. A. Hart, Vice President, CIIT, Box 12137, Research Triangle Park, North Carolina 27709.)

Mr. **Walgren**. Thank you very much, Dr. Mathis. We certainly appreciate that. I suppose there are real limitations in generalizing from the kinds of hurdles you have overcome to what would be presented to a for-profit and actual effort with a real proprietary purpose rather than an effort that is very much related to the good will and the viability of the chemical industry, I would imagine.

Mr. **Mathis**. No question.

Mr. **Walgren**. But it is an example of how these things can happen.

Have you heard of similar efforts in related industries, that they come to you and discuss possibilities that then have not been gone forward with by any organizations?

Dr. **Mathis**. I don't know of any that have not gone forward with. Perhaps you do, Milton. There are similar efforts that I know about, but those have proceeded. One of them I am familiar with that also involves a chemical industry is the Council for Chemical Research. Now that is an activity involving some 40 companies, I think, and 160 departments of chemistry and chemical engineering in universities. In that instance the purpose is to increase the flow of both information and cooperation between industry and the universities.

But that is quite a similar thing. As a matter of fact, Mr. Wessel was also involved in helping set that up.

You might comment though. You have been involved in one or two others that I know of.

Mr. **Wessel**. I don't personally know of any general research proposal which has not gone forward because of any antitrust considerations. I would briefly like to say the term "joint research" or "joint effort" is an ambiguous term and it may mean different things to different people and it may well be that there are varieties of ways of approaching those problems, not necessarily through the MCC model, which will achieve the function for the purpose you are seeking to achieve, that is, enhancement of basic research increasing American competence versus the world, and so forth, via some effort which is not necessarily the one that either Mr. Baxter or the other panel was talking about.

I think CIIT is one. It is truly a nonprofit effort but it is engaged in by for-profit companies and obviously their interests are such that their ultimate objective is to enhance their position and so that is also true of CCR, the Council for Chemical Research.

Mr. **Walgren**. In your organization, have there been developments that led to patents or other kinds of proprietary interests that then had to be dealt with and shared?

Dr. **Mathis**. No, but I mentioned earlier that we were concerned that these toxicological findings could represent quite a competitive factor. For example, some of CIIT's work was done on benzene, and had we found something in the benzene area, all the makers of benzene save a few are in the room and knowing that I might want to go out and do something about my benzene plant or business that would not be readily available to other people.

So I think that is where the competitive element is. It is not likely at all to be in the patent or licensing area.

Mr. **Walgren**. I see.

Well, thank you very much for your contribution and your patience. We certainly appreciate it.

Dr. **Mathis**. You are very welcome.

Mr. **Walgren**. Do we have everyone on the last panel here? Let's come forward then, Steven Olson, assistant general counsel of Control Data Corp.; Joseph Brodley, Boston University School of Law; Gerald Sobel, Kaye, Scholer, Spearman, Hayes & Hendler; and Alvin Stein of another law firm, and Douglas Ginsburg of Harvard Law School.

Mr. **Sobel**. I think we are all here but Mr. Olson, who should be here in a moment.

Mr. **Gore**. Fine.

Well, let's go forward.

Welcome, gentlemen, and thank you for your patience. Your written statements will be made a part of the record, and in view of the number and the time I guess it becomes pretty obvious if I can suggest that you try to outline the points that you feel are most important for the record that will help the staff and the other members reading the record be able to get at them if they are in short or more outlined form than the full text.

But in any event, let's proceed in the order that we called you, starting with Mr. Olson.

STATEMENT OF STEVEN J. OLSON, ASSOCIATE GENERAL COUNSEL, CONTROL DATA CORP.

Mr. **Olson**. Thank you, Mr. Chairman.

My name is Steve Olsen. I am associate general counsel of Control Data Corp., having been with the company about 1½ years now.

Prior to that time I was in the private practice of law in the Twin Cities, Minneapolis and St. Paul, with some emphasis in antitrust law. I would gladly accept your invitation to place on the record my prepared testimony and try to limit my comments to only four or five key points which I think are of particular interest to you based on some of the questions which I have heard from previous panels.

The first of these is ambiguity in the antitrust law. There seems to be a consensus from everybody that you have heard that there is significant ambiguity as applied to R&D joint ventures. Plus I don't propose to spell out what that ambiguity is but rather focus on the more pertinent question of whether that ambiguity does, in fact, deter a business executive from engaging in cooperative research and development.

I have heard testimony and comments from other panels saying that there are no cases where particular ventures have been attacked and by reason of this there is no deterrence by reason of the antitrust laws. I would simply observe that that fact does not really say anything as it may more accurately prove that the antitrust laws are in fact a very effective deterrent of cooperative R&D in that significant joint ventures to do research and development have not been formed to attack.

Others have said there is no need for clarification simply because various people are unable to name particular companies who have refused to join R&D joint ventures by reason of the antitrust laws citing that as the principal impediment. This, it seems to me, also ignores the reality of the situation and that a simple polling of executives looking for yes/no answers in that area is not going to yeild much information.

In my experience decisions made by executives in this area are very similar to the decisions they make in any other area where they are asked to weigh the pros and cons of the activity that they are contemplating undertaking. The simple fact is that when they balance the pros on the one hand against the cons on the other, the antitrust laws are always very, very high on the list of the cons.

Antitrust concern always is one of the major considerations and it inevitably is on the negative side of this balance that will influence the business executive's decisions.

It seems to me that if, as so many witness have said it, that in order to increase the productivity and competitiveness of this country we need to encourage cooperation in R&D that the best thing that Congress can do is change that balance to one where it always tips it on the negative side of the scale to at least the neutrality, but more preferably that Congress express a desire that such activities be taken and, in fact, pass legislation which would state the will of the Congress that it wants to encourage such activity in today's environment.

Particularly appropriate and I have heard many questions concerning MCC, I was involved in the formation with Control Data of MCC and there seems to be some suggestion that since MCC was formed this must mean there is not any real problem under the antitrust laws.

I would beg to differ with that. There is a tendency I think in any area of life to review accomplishments as something when you look back at them that came very easy. Well, I can assure you that the formation of MCC was far from easy and it only occurred because of the dedication of the very senior executives of Control Data, Bill Morris and Bob Price, who devoted countless hours in this effort.

They had to overcome very significant resistance and obstacles in the various companies from the legal departments clear up to the chief executives and I don't think that you can cite MCC as an example of it being easy because, believe me, I can assure you it was not.

Second, I could not help but think this morning as I looked around at these walls of the space program. MCC, I guess you could characterize as being closest to that picture over there where the rocket is just lifting off the ground. It is entering up there to the blackness of space, the murkiness of space, not knowing what it is going to encounter and what has been the experience of MCC before it has even left the atmosphere.

I would suggest that before we even had a CEO, before we had even really defined the research projects we were going to pursue, the first thing to arrive in the mail was a letter from a private antitrust lawyer saying that this thing is illegal. So I would beg to differ with those who suggest that MCC evidences no problem in the antitrust laws and I would say the experience of MCC indeed shows there is a problem with the antitrust laws.

Mr. **Gore**. If I may interject. Earlier this morning I said that it was possible to create MCC without apparently violating the antitrust laws. That is the only point that I am seeking to make. I did not want to try to make the point that it was easy. I understand that you personally put a great deal of work into the creation of MCC.

Mr. **Olson**. Mr. Chairman, I was not being critical of your comments specifically, but I have heard from many sources and some of the statements that I have seen that this was the case. Which brings me close to closing.

I would like to address something that you, Congressman Gore, said this morning that you are very concerned that there not be an over-reaction here. I believe that was the phrase you used, and it seems to me that if you look at the bills that are being considered we are not talking about a major restructuring of the antitrust laws. Ignoring for the moment some of the peripheral proposals being made by the antitrust division.

Mr. **Gore**. Well, that is really what I was referring to, Mr. Olson. The bills that have been presented, it is arguable how significant the changes are but the agenda of the Justice Department I think it is fair to say goes far beyond the specific changes that may well be warranted.

Mr. **Olson**. That really is the point I wanted to make but if you focus on some of the more limited bills that really address the R&D problem they are not really changing the laws. They are seeking to clarify the laws to permit socially desirable behavior.

I would like to comment quickly. People have criticized H.R.1952 as not being flexible, I believe somebody noted this morning. We don't feel that to be the case. 1952 seeks to set forth specific standards which, if company meet them they enter into a safe harbor. There is nothing in there to suggest that if companies clearly don't have any problems with the antitrust laws that they have all the flexibility they want to continue to form ventures under existing law without being inhibited by 1952; 1952 would merely say, if you have some doubts, if you do these things the price you pay complying with these standards you will enter into a safe harbor.

Similarly on the Department of Justice bill which has been described as being flexible and a preferred approach, I think it would provide a very, very great step forward in this whole process. The one criticism I have and I have not had an opportunity to study it I guess because there is not a bill yet, but my understanding of it is that you would simply file something with the Department and you would be immune until such time as they challenged you with an injunction. The problem from the business executive's point of view is that he is going to be concerned that 3 years down the road under a new administration a different antitrust division may enter the picture and decide to challenge the venture and reverse all of the progress to that date. This is not a fanciful concern. I think if you look at the record 3 years ago there was a Department of Justice that was willing to indict a company for vertical price fixing. The present antitrust division seems inclined to argue at least in the Supreme Court that vertical price fixing should be handled under the rule of reason which is a profound change in 3 years.

Thus the problem with the antitrust laws I think that unlike our national desire that we operate as a government of laws and not of men so often it is a government of men and not of laws, and I will end right there.

[The biographical sketch and prepared statement of Mr. Olson follow:]

Steven J. Olson

Born Virginia, Minnesota, April 1, 1940. Graduated from Hamline University, St. Paul, MN. (B.A. *summa cum laude*, 1962); and Harvard Law School (LL.B., *cum laude*, 1965). Admitted to Bar of Minnesota (1965).

Currently Associate General Counsel, Control Data Corporation, Minneapolis, MN. Formerly Partner, Oppenheimer, Wolff, Foster, Shepard, and Donnelly, St. Paul and Minneapolis, MN. (1965-1981).

S. J. OLSON TESTIMONY

HOUSE SCIENCE AND TECHNOLOGY COMMITTEE
-SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
-SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

JUNE 30, 1983

A. INTRODUCTION

MR CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEES:

MY NAME IS STEVEN J. OLSON, ASSOCIATE GENERAL COUNSEL OF CONTROL DATA CORPORATION. PRIOR TO JOINING CONTROL DATA IN 1981, I WAS IN PRIVATE PRACTICE WITH A LAW FIRM IN ST. PAUL, MINNESOTA FOR 16 YEARS, WITH A SIGNIFICANT PORTION OF MY PRACTICE DIRECTED TO ANTITRUST LAW.

CONTROL DATA HAS BEEN OUTSPOKEN IN DESCRIBING THE CHALLENGES TO OUR NATION'S LEADERSHIP IN SCIENCE AND TECHNOLOGY, AND IN PROPOSING STEPS--INCLUDING A CLARIFICATION OF U.S. ANTITRUST LAWS--THAT WOULD RESPOND TO SUCH CHALLENGES. I AM REFERRING, FOR EXAMPLE, TO YESTERDAY'S TESTIMONY BY JOHN LACEY, AND TO THE STATEMENT OF WILLIAM C. NORRIS, CONTROL DATA'S CHAIRMAN, TO THE SENATE JUDICIARY COMMITTEE (ALSO DELIVERED YESTERDAY). THESE STATEMENTS WARN THAT THE CONSEQUENCES OF A FURTHER DETERIORATION IN OUR TECHNOLOGICAL POSITION ARE GRAVE INDEED.

RATHER THAN REPLOW THIS GROUND, I WOULD LIKE TO SHARE SOME THOUGHTS BASED ON MY EXPERIENCE AS AN ANTITRUST LAWYER.

INVOLVED BOTH IN LITIGATION AND IN COUNSELING CORPORATE CLIENTS CONTEMPLATING JOINT VENTURE RELATIONSHIPS. IN THIS CONNECTION, IT WAS MY PRIVILEGE TO BE DEEPLY INVOLVED IN THE FORMATION OF A COMPANY CALLED "MCC"--WHICH STANDS FOR MICROELECTRONICS AND COMPUTER TECHNOLOGY CORPORATION. AS YOU HAVE HEARD, MCC IS A RESEARCH AND DEVELOPMENT JOINT VENTURE BY A GROUP OF AMERICAN COMPUTER AND SEMICONDUCTOR COMPANIES TO COOPERATE IN DEVELOPING A BROAD BASE OF FUNDAMENTAL TECHNOLOGIES. ADMIRAL INMAN, WHO ALSO APPEARED BEFORE YOU YESTERDAY, IS MCC'S CEO.

BUT MY COMMENTS TODAY ARE NOT NECESSARILY REFLECTIVE OF THE MCC SITUATION, OR ANY OTHER PARTICULAR VENTURE. I MUST SAY THAT, BECAUSE I HAVE A "PERCEPTION"--JUST AS BUSINESS EXECUTIVES HAVE "PERCEPTIONS," WHICH I'LL GET TO IN A MOMENT--THAT SOME PRIVATE ANTITRUST LAWYERS MIGHT CONTEND IN THE FUTURE THAT ANY CLIENT-SPECIFIC STATEMENTS I MAKE TODAY ARE AVAILABLE AS ADMISSION STATEMENTS TO BE USED AGAINST THAT CLIENT IN ANOTHER CONTEXT, OR SOMEHOW RESULTED IN A WAIVER OF ANY APPLICABLE ATTORNEY-CLIENT PRIVILEGE.

B. AMBIGUITY IN ANTITRUST LAWS DETER COOPERATION

1. AMBIGUITY.

IF THIS COMMITTEE SHOULD CONCLUDE--CORRECTLY, I BELIEVE--THAT A CHANGED WORLD ENVIRONMENT DICTATES INCREASED COOPERATION AMONG BUSINESSES TO SPUR ADDITIONAL TECHNOLOGICAL INNOVATION IN THIS COUNTRY, IT MUST RECOGNIZE THE EXISTENCE OF SUBSTANTIAL AMBIGUITIES IN THE APPLICATION OF U.S. ANTITRUST LAWS TO TO SUCH ACTIVITY. FOR UNDER THE PRESENT STATE OF THE ANTITRUST LAW IN THIS COUNTRY, IT IS VIRTUALLY IMPOSSIBLE TO FORMULATE A SITUATION WHEREBY BUSINESS EXECUTIVES CAN BE ASSURED BY THEIR LAWYERS IN ADVANCE THAT

COOPERATION IN RESEARCH AND DEVELOPMENT WILL NOT EXPOSE THEM TO EVENTUAL LIABILITY IN A LAWSUIT. IT IS IRONICAL THAT THIS IS PARTICULARLY TRUE IF THE COOPERATION PROVES SUCCESSFUL, IN THE SENSE OF YIELDING THE VERY TECHNOLOGICAL BREAKTHROUGHS OUR SOCIETY NEEDS.

LET ME ELABORATE FOR A MOMENT, WITH PARTICULAR EMPHASIS ON THE WORD "CLAIM" AND THE QUESTION OF "SUCCESS." I THINK IT FAIR TO SAY THAT AT THE TIME A JOINT R&D VENTURE IS FORMED, MOST ANTITRUST LAWYERS CAN AGREE ON THE VARIOUS FACTORS TO BE CONSIDERED; THE JUSTICE DEPARTMENT "GUIDELINES" HAVE BEEN VERY HELPFUL IN THIS REGARD. THE REAL DIFFICULTY--AND DISAGREEMENT-- COMES WHEN LAWYERS AND ECONOMISTS ASCRIBE THE RELATIVE WEIGHTS TO BE ACCORDED, IN ANY GIVEN SITUATION, TO EACH OF SUCH FACTORS--SINCE THE ISSUE ULTIMATELY TURNS ON WHETHER THE VENTURE "MAY" LESSEN COMPETITION OR EVEN POTENTIAL COMPETITION--HYPOTHETICAL NOTIONS THAT SEEM DIFFICULT TO WEIGH AGAINST ECONOMIC REALITIES THAT REQUIRE FAST-PACED INNOVATION AND SHARP REDUCTIONS IN PRODUCT COSTS IF COMPETITION FROM EUROPE AND JAPAN IS TO BE EFFECTIVELY MET.

MR. WILLIAM BAXTER, THE ASSISTANT ATTORNEY GENERAL IN CHARGE OF THE ANTITRUST DIVISION OF THE DEPARTMENT OF JUSTICE, RECOGNIZED SOME TIME AGO THE INHERENT DIFFICULTY IN GIVING DEFINITIVE LEGAL ADVICE IN RULE OF REASON SITUATIONS WHEN HE WROTE:

> "...(T)HE RULE OF REASON (IS) NOT SO MUCH A COHERENT RULE AS IT (IS) A CANDID RECOGNITION THAT THE COURTS (ARE) EMPOWERED, AND INDEED REQUIRED, BY SECTION 1 (OF THE SHERMAN ACT) TO WANDER THROUGH THE WHOLE OF THE SOCIAL AND ECONOMIC CALCULUS, IN AN EFFORT TO SAY WHETHER A GIVEN INSTANCE OF COOPERATION BETWEEN

> SEPARATE ENTITIES WAS LIKELY TO YIELD MORE BY WAY OF SOCIAL BENEFITS THAN WAS LOST BY THE RESULTING DIMINUTION OF COMPETITIVE RIVALRY...
>
> ...THE PASSAGE OF TIME AND DECISIONS HAS DONE LITTLE TO NARROW THE FRAMEWORK OF THE ANALYSIS RESORTED TO, TO IMPROVE THE PREDICTABILITY OF OUTCOMES OR TO GIVE MUCH ASSURANCE THAT JUSTICE, IN ANY OF ITS MANY MEANINGS, IS BEING SERVED." BAXTER _ET AL_., _RETAIL BANKING IN THE ELECTRONIC AGE_, AT 73-74 (1977)

THUS BUSINESS EXECUTIVES ARE INEVITABLY GIVEN LEGAL ADVICE IN THE MOST GUARDED TERMS--WHERE THE ULTIMATE LEGALITY OR ILLEGALITY OF THEIR ACTIONS, THEY ARE TOLD, CAN ONLY BE CONCLUSIVELY DETERMINED BY LITIGATION--A COMPLEX AND EXPENSIVE, AND TOTALLY NON-PRODUCTIVE EXERCISE. IT REMINDS ME OF A NEWSPAPER COLUMN I ONCE READ IN WHICH THE COLUMNIST ADMITTED THAT HIS ONLY KNOWLEDGE OF LAW CAME FROM OLD POLICE MOVIES. AS A RESULT, HE SAID, HE GREW UP BELIEVING THAT "SUSPICION"--AS IN "BOOK HIM ON SUSPICION"--WAS A PERFECTLY LEGITIMATE CHARGE. IN THE BUSINESS COMMUNITY, THERE IS A SUBSTANTIAL BODY OF OPINION THAT THE ANTITRUST LAWS DO IN FACT OPERATE ON THAT BASIS.

2. _DETERRENCE_

BUT THE FACT THAT PRESENT ANTITRUST LAW IS AMBIGUOUS AND DIFFICULT TO APPLY ADDRESSES ONLY HALF OF THE QUESTION. THE ISSUE REMAINS AS TO WHETHER THAT AMBIGUITY IN FACT DETERS BUSINESS EXECUTIVES FROM PARTICIPATING IN RESEARCH JOINT VENTURES. THE ANSWER, OF COURSE, IS "NOT INEVITABLY"--AFTER ALL, SUCH VENTURES DO EXIST, MCC BEING A RECENT EXAMPLE. AND I WOULD NOT SUGGEST FOR A MOMENT THAT ANTITRUST CONCERNS ARE THE _ONLY_ HURDLE TO INCREASED COOPERATION. THE FACT IS THAT THERE ARE MANY REASONS THAT COMPANIES MAY BE RELUCTANT TO

COOPERATE--SOME OF WHICH ARE DEEPLY INGRAINED IN OUR BUSINESS CULTURE. BUT THAT IS HARDLY AN ARGUMENT FOR NOT CLARIFYING OUR ANTITRUST LAWS IF THE FACT OF THEIR AMBIGUITY SUBSTANTIALLY CONTRIBUTES TO THE RELUCTANCE OF BUSINESSES TO COOPERATE IN R&D. IN FACT, THOSE WHO ARGUE THAT ANTITRUST LAWS ARE NOT A DETERRENT TO VENTURE FORMATION WOULD SEEM TO BE WASTING THEIR TIME IN RESISTING LEGISLATION TO CLARIFY THE LAW, SINCE SUCH LOGIC COMPELS THE CONCLUSION THAT THESE VENTURES WON'T BE FORMED ANYWAY. BUT BOTH LOGIC AND EXPERIENCE CLEARLY INDICATE THAT CLARIFICATION OF THE LAW WOULD MAKE A DIFFERENCE.

IN DEALING WITH LEGAL QUESTIONS, BUSINESS EXECUTIVES CAN LIVE WITH ALMOST ANY ARBITRARY RULE--THEY WON'T LIKE IT, BUT THEY CAN ADJUST TO IT. BUT THEY ABHOR UNCERTAINTY. THEY ARE PARTICULARLY UNCOMFORTABLE IF THE RISK AND COSTS OF BEING WRONG CANNOT BE MEANINGFULLY QUANTIFIED IN ADVANCE. THIS IS PRECISELY THE SITUATION FACING BUSINESS EXECUTIVES TODAY IN THE AREA OF JOINT R&D--THEY HAVE BEEN FORCED INTO A SITUATION WHERE THE GO/NO-GO DECISION TO JOIN A COOPERATIVE R&D VENTURE MUST BE BASED ON THE "HOPE" THAT THE JUDGMENT OF THE COMPANY'S LAWYER WILL ULTIMATELY BE SUSTAINED BY A MAJORITY OF THE LEGAL AND ECONOMIC THEORISTS WHO WILL EVENTUALLY EXAMINE ITS CONDUCT WITH THE BENEFIT OF 20/20 HINDSIGHT; WHERE A WRONG DECISION COULD THREATEN THE SURVIVAL OF THE COMPANY AND WHERE EVEN A RIGHT DECISION STILL EXPOSES THE COMPANY TO THE POSSIBLE (IF NOT PROBABLE) EXPENDITURE OF WEEKS OR MONTHS OF EXECUTIVE TIME AND THOUSANDS IF NOT MILLIONS OF DOLLARS IN DEFENSE COSTS.

THE CONFUSION UNDER CURRENT LAW IS COMPOUNDED BY THE FACT THAT, EVEN IF THE JUSTICE DEPARTMENT OR FTC SHOULD AGREE THAT AN R&D VENTURE PASSES MUSTER, THERE ARE A LOT OF PRIVATE LAWYERS READY AND WILLING TO DISAGREE. FOR EXAMPLE, AS I'M SURE MANY OF YOU ARE AWARE, A SAN FRANCISCO ANTITRUST LAWYER WHO GENERALLY REPRESENTS TREBLE-DAMAGE PLAINTIFFS--JOSEPH ALIOTO--HAS WRITTEN EACH MCC

SHAREHOLDER STATING FLAT-OUT THAT HE THINKS MCC IS ILLEGAL. IS IT ANY WONDER THAT BUSINESS PERSONS ARE DETERRED FROM JOINT RESEARCH ACTIVITIES?

AND THEY ARE DETERRED. MANY WON'T EVEN CONSIDER COOPERATIVE ACTIVITY UNTIL THEY ARE CONVINCED THAT THERE IS NO OTHER AVENUE OPEN TO THEM. THERE ARE THOSE THAT SAY THIS "PERCEPTION" BY EXECUTIVES THAT THE UNKNOWN ANTITRUST RISKS OF COOPERATIVE R&D OUTWEIGH THE BENEFITS (ALSO UNKNOWN) ARE WRONGHEADED--THAT THE INSTANCES WHERE SUCH VENTURES HAVE BEEN CHALLENGED ARE EITHER NON-EXISTENT OR FEW AND FAR BETWEEN. THAT MAY BE TRUE, BUT THAT IS HARDLY BECAUSE THE ANTITRUST LAWS ARE CLEAR: IT IS BECAUSE, FIRST, THERE HAS BEEN AN OVERALL ABSENCE OF SIGNIFICANT R&D VENTURE ACTIVITY TO ATTACK AND, SECOND, WHEN VENTURES HAVE BEEN CHALLENGED, THE TENDENCY IS TO ACQUIESCE IN THE DEMANDS OF THE CHALLENGER--AS BY GRANTING ACCESS TO THE FRUITS OF THE VENTURE. THESE CONSIDERATIONS IN FACT FEED THE "PERCEPTION" THAT THERE IS A PROBLEM--SINCE EXECUTIVES ALREADY SUSPICIOUS OF JOINT ACTIVITY SEE A JUSTIFICATION FOR THEIR RELUCTANCE IN THE RELUCTANCE OF OTHERS, AND SINCE "SUCCESSFUL" VENTURES (IN THE SENSE OF DEVELOPING NEW AND USABLE TECHNOLOGIES) ARE IRONICALLY THE MOST LIKELY TO BE CHALLENGED, SINCE THEY BY DEFINITION CREATE A POTENTIAL CLASS OF PLAINTIFFS WHOSE "OX IS GORED" BY THE NEW TECHNOLOGY. THUS MANY EXECUTIVES SENSE A TOTALLY NO-WIN SITUATION--WHERE THERE ARE NOT ONLY THE NORMAL RISKS OF FAILURE BUT ALSO THE ABNORMAL RISKS OF SUCCESS.

C. THE ANTITRUST BIAS AGAINST COLLABORATION.

IN RECENT YEARS, WE HAVE BEEN WITNESSING A DRAMATIC CHANGE OF DIRECTION IN ANTITRUST POLICY. BOTH COURTS AND ENFORCEMENT OFFICIALS TODAY SEEM FAR LESS WILLING TO SACRIFICE ECONOMIC EFFICIENCY ON THE ALTAR OF INCREASING COMPETITION. THERE SEEMS

TO BE A SENTIMENT EMERGING THAT THE TRADITIONAL ANTITRUST VIEW FAVORING A NATION OF SMALL SHOPKEEPERS DOES NOT SERVE THE INTERESTS OF THE NATION IN TODAY'S GLOBAL MARKETS. THE EVOLUTION HAS BEEN GOING ON FOR YEARS. GENERAL DYNAMICS AND MARINE BANCORPORATION SUGGESTED A NEW WILLINGNESS TO APPLY MORE RIGOROUS ANALYSIS TO MERGER CASES. KODAK AND IBM RAISED QUESTIONS ABOUT THE CONTINUED VIABILITY OF THE ALCOA STANDARD FOR MONOPOLIZATION CASES. FORTNER II SHARPLY RESTRICTED THE BROAD SWEEP OF ITS PREDECESSOR. AND IN CONTINENTAL TV THE SUPREME COURT WENT OUT OF ITS WAY TO REVERSE THE MUCH CRITICIZED PER SE RULE FOR VERTICAL TERRITORIAL ALLOCATION.

THE CURRENT ADMINISTRATION HAS, AMONG OTHER THINGS, DISPOSED OF MASSIVE MONOPOLIZATION CASES AGAINST IBM AND AT&T, AND HAS REVEALED A DISINCLINATION TO BRING OTHERS; HAS PROPOSED THE SUBSTANTIAL MODIFICATION OR ABANDONMENT OF THE TRADITIONAL NINE "NO-NOS" IN THE AREA OF PATENT LICENSE RESTRICTIONS; HAS ARGUED--AS AMICUS BEFORE THE SUPREME COURT--THAT VERTICAL PRICE FIXING (SPRAY-RITE) AND TYING (JEFFERSON PARRISH) SHOULD NOT BE PER SE ILLEGAL; HAS COME CLOSE TO SAYING THAT PURELY VERTICAL OR CONGLOMERATE MERGERS SHALL NEVER BE ILLEGAL, AND EVEN IN THE CASE OF HORIZONTAL MERGERS, HAS PROMULGATED A MORE PERMISSIVE ANALYTICAL APPROACH; AND HAS CONTINUED TO EXPRESS HOSTILITY TO THE ROBINSON-PATMAN ACT. WE COULD INCREASE THIS LIST, BUT THE CENTRAL THEME SEEMS EVIDENT. BOTH ENFORCEMENT AUTHORITIES AND COURTS SEEM FAR MORE WILLING THAN AT ANY TIME IN RECENT HISTORY TO TOLERATE THE ACCUMULATION AND EXERCISE OF ECONOMIC POWER--SO LONG AS IT IS EITHER EXERCISED BY A SINGLE FIRM OR RESULTS FROM THE FORMATION OF A SINGLE FIRM.

THERE ARE, I SUPPOSE, A HUNDRED REASONS FOR THESE DEVELOPMENTS AND I WON'T TRY TO ENUMERATE THEM HERE, BUT I WILL MENTION A COUPLE OF POSSIBILITIES. IT MAY BE THAT WE ARE COMING TO RECOGNIZE SOME BASIC ECONOMIC RULES. ULTIMATELY, THE STANDARD OF LIVING OF ANY SOCIETY DEPENDS ENTIRELY ON THE VALUE

OF GOODS AND SERVICES IT CAN PRODUCE FOR EACH UNIT OF LABOR--A TEXTBOOK DEFINITION OF PRODUCTIVITY. FOR SOME TIME, THE UNITED STATES HAS BEEN THE MOST PRODUCTIVE MAJOR NATION ON EARTH, A FACT THAT IS REFLECTED IN OUR STANDARD OF LIVING. ONE OF THE WAYS WE HAVE CHOSEN TO "SPEND" THAT BENEFIT, THROUGH OUR ANTITRUST LAWS, IS BY FAVORING COMPETITION EVEN AT THE EXPENSE OF ECONOMIC EFFICIENCY. THE PRINCIPAL REASONS FOR MAKING THAT CHOICE ARE PROBABLY A BELIEF THAT IT WOULD PAY OFF IN LONG TERM ECONOMIC BENEFITS AND WOULD, IN ANY EVENT, PROVIDE AN ECONOMIC ENVIRONMENT CONSISTENT WITH A SOCIAL/POLITICAL SYSTEM THAT FAVORS DISPERSED POWER AND OPPORTUNITY.

TODAY, WE MAY BE IN THE PROCESS OF RETREATING FROM THAT COMMITMENT FOR A NUMBER OF EQUALLY BASIC REASONS.

- OUR PRODUCTIVITY ADVANTAGE--THE PREMIUM--IS DISAPPEARING AND WE HAVE LESS OF IT TO "SPEND." FOR WHAT REMAINS, WE ARE DECIDING TO SPEND IT IN DIFFERENT WAYS.

- WE CAN NO LONGER "INTERNALIZE" THE COSTS OF COMPETITION AND DIVERSITY. WHEN THE U.S. ECONOMY WAS ALMOST ENTIRELY PROTECTED BY NATURAL, ECONOMIC AND LEGAL BARRIERS, AN INEFFICIENT CHOICE IN FAVOR OF MORE COMPETITION SIMPLY HAD THE EFFECT OF DISTRIBUTING BENEFITS TO OTHER SECTORS OF THE ECONOMY--USUALLY SMALL BUSINESS. NOW SUCH CHOICES INCREASINGLY HAVE THE EFFECT OF DISTRIBUTING THE BENEFIT--THE COMPETITIVE ADVANTAGE--TO JAPAN.

- FOR MANY OF US, OUR PRODUCTS AND SERVICES ARE INCREASINGLY "SYSTEMS" OF PRODUCTS AND SERVICES THAT MUST BE COORDINATED IN MORE AND MORE COMPLEX WAYS.

THIS CAN BE ACCOMPLISHED EITHER BY COOPERATION AMONG ENTERPRISES OR BY CREATING LARGER, INTEGRATED ENTERPRISES. THE ANTITRUST LAWS SEEM TO BE FAVORING THE LATTER.

- THE SCALE OF EFFICIENT OPERATION IN MANY INDUSTRIAL SECTORS IS INCREASING SHARPLY. AGAIN, IN A WORLDWIDE COMPETITIVE ENVIRONMENT WE CAN CHOOSE TO PERMIT GREATER COOPERATION TO MAKE THOSE ECONOMIES AVAILABLE TO MANY ENTERPRISES OR WE CAN CHOOSE TO TOLERATE VERY LARGE ENTERPRISES THAT CAN REALIZE THE ECONOMIES INTERNALLY. WE CANNOT CHOOSE TO IGNORE THE ECONOMIES AVAILABLE WITHOUT SACRIFICING OUR STANDARD OF LIVING.

THUS, ANTITRUST SEEMS TO BE AWAKENING TO THE FACT THAT IT MUST FUNCTION CONSISTENTLY WITH WORLD ECONOMIC REALITIES. WE HAVE ALREADY MOVED FAR IN THE DIRECTION OF A TRUE WORLD ECONOMY AND THERE IS NO TURNING AWAY FROM THAT CHOICE. WE MUST BE ABLE TO DEAL EFFECTIVELY WITH COMPLEX SYSTEMS AND REALIZE AVAILABLE ECONOMIES OF SCALE. IF WE DON'T, WE WILL TURN OUR MARKETS OVER BY DEFAULT TO OUR COMPETITORS OVERSEAS.

THERE IS CAUSE FOR CONCERN, HOWEVER, IN THE DIRECTION WE SEEM TO BE HEADING. THE QUICK FIX IS TO TOLERATE THE FORMATION OF HUGE ENTERPRISES THAT CAN EFFECTIVELY WIELD POWER IN WORLD MARKETS, CAN INTERNALLY ACHIEVE AVAILABLE ECONOMIES OF SCALE, AND CAN INTERNALLY BRING TOGETHER THE DIVERSE ELEMENTS OF COMPLEX SYSTEMS. EVEN IF THAT FIX IS EFFECTIVE IN THE SHORT RUN. IT IS QUITE POSSIBLY THE WRONG SOLUTION OVER THE LONG TERM. THERE IS ECONOMIC, SOCIAL AND POLITICAL VALUE IN THE DIVERSITY AND DECENTRALIZATION THAT HAS HISTORICALLY CHARACTERIZED OUR ECONOMY, AND WE SHOULD NOT ABANDON IT SO QUICKLY. MOREOVER, THE LONG TERM RESULT OF A CENTRALIZED

APPROACH IS VERY LIKELY TO BE THE DEVELOPMENT OF STABLE BUT OSSIFIED INDUSTRIES THAT WILL NOT BE STRONG COMPETITORS ANYWAY. OUR FRIENDS IN AUTOS AND STEEL HAVE ALREADY SHOWN US WHERE THAT PATH LEADS.

INSTEAD, WE SHOULD BE LOOKING FOR WAYS TO ACHIEVE THE INTEGRATED, HIGH VOLUME OPERATIONS WE NEED WITHOUT SACRIFICING THE DIVERSITY WE VALUE. YET, THE ANTITRUST LAWS AND THOSE WHO ENFORCE THEM SEEM TO REMAIN FIRM IN THEIR BIAS AGAINST COLLABORATION AMONG COMPETITORS. THE ASSISTANT ATTORNEY GENERAL RAILS AGAINST EXECUTIVES EVEN COMPARING GOLF SCORES, AND THE SUPREME COURT, IN TEXAS INDUSTRIES, REAFFIRMS THE RULE THAT ANTITRUST DEFENDANTS ARE NOT ENTITLED TO CONTRIBUTION FROM THEIR CO-CONSPIRATORS. BECAUSE THE RULE, BY DEFINITION, APPLIES ALMOST ENTIRELY TO MULTI-PARTY CASES, AND BECAUSE THE RESULT IS TO HOLD THE SPECTOR OF ENORMOUS DAMAGES OVER THE HEAD OF SMALL OR MINOR PARTICIPANTS, THE EFFECT IS TO DETER VERY STRONGLY ANY COLLABORATION AMONG COMPETITORS, PARTICULARLY THE SMALL AND FINANCIALLY WEAK.

A GREAT DEAL OF CONTROL DATA'S BUSINESS STRATEGY HAS INVOLVED THE USE OF COOPERATION AND JOINT VENTURES WITH COMPANIES THAT SOME PROSECUTORS OR PLAINTIFFS MIGHT CHARACTERIZE AS COMPETITORS. IN CONTROL DATA'S VIEW THOSE VENTURES HAVE ENABLED IT AND A NUMBER OF OTHER COMPANIES TO OBTAIN RISK DISTRIBUTION AND ECONOMIES OF SCALE NECESSARY TO ENTER NEW MARKETS AND REMAIN COMPETITIVE IN CURRENT ONES WITHOUT SACRIFICING THEIR BASIC INDEPENDENCE.

IT SEEMS TO ME THAT THIS IS A MOST WORTHY GOAL--AND ONE THAT SHOULD BE ENCOURAGED BY CONGRESS. THE TASK, THEN, IS TO FIND NEW WAYS TO OBTAIN THE ECONOMIES THAT ARE AVAILABLE WITHOUT SACRIFICING THE COMPETITIVENESS AND BASIC INDEPENDENCE

WE VALUE. IN A SENSE, THIS IS WHAT CONGRESS WAS ENCOURAGING IN ITS RECENT ENACTMENT OF THE EXPORT TRADING COMPANY ACT. AND THIS IS PRECISELY WHAT CLARIFYING THE ANTITRUST LAWS AS THEY RELATE TO COOPERATIVE R&D--AS CONTEMPLATED BY H.R. 1952--SEEKS TO ACCOMPLISH.

D. CLARIFYING LEGISLATION.

SEVERAL BILLS HAVE BEEN INTRODUCED IN THIS SESSION DESIGNED TO ENCOURAGE R&D COOPERATION AMONG U.S. FIRMS. ALL OF THEM RECOGNIZE THAT THE COMBINATION OF AMBIGUITIES AND SEVERE PENALTIES UNDER CURRENT LAW DETER SOCIALLY-DESIRABLE BEHAVIOR. SOME ADDRESS THE QUESTION OF PENALTIES BY PROVIDING THAT:

- ANY RULE OF REASON LIABILITY ARISING OUT OF AN ACTIVITY DEFINED BY CONGRESS AS "RESEARCH AND DEVELOPMENT" SHOULD BE LIMITED TO ACTUAL DAMAGES, NOT TREBLE DAMAGES; AND
- IN ANY LITIGATION ARISING OUT OF SUCH ACTIVITY, ATTORNEYS' FEES SHOULD BE AWARDED TO THE PREVAILING PARTY--DEFENDANTS AS WELL AS PLAINTIFFS.

I AGREE WITH SUCH EFFORTS, AND URGE YOU TO SUPPORT THEM.

BUT SUCH PROVISIONS, STANDING ALONE, DO NOT CLARIFY THE LAW, AND THUS MAY FALL SHORT OF BRINGING ABOUT THE WIDESPREAD COOPERATION THAT IS NEEDED. H.R. 1952, INTRODUCED BY REP. SYNAR, GEPHARDT, WYDEN AND ZSCHAU, AND CO-SPONSORED BY CONGRESSMAN WALGREN AND SEVERAL OTHER MEMBERS OF THIS COMMITTEE, EMBODIES A MORE COMPREHENSIVE AND EFFECTIVE APPROACH. UNDER ITS PROVISIONS, CONGRESS WOULD PRESCRIBE STATUTORY CRITERIA FOR LAWFULLY ORGANIZING AND CONDUCTING JOINT

R&D VENTURES WHICH, IF MET WOULD SHIELD A VENTURE FROM ANTITRUST ATTACK. A SET OF OBJECTIVE STANDARDS OR RULES WOULD BE ENACTED, AND THOSE COMPANIES DESIRING TO COOPERATE IN R&D COULD THEN PLAN AND IMPLEMENT THEIR ACTIVITIES ACCORDINGLY. THIS WOULD REMOVE EXISTING UNCERTAINTY BECAUSE COMPANIES WOULD KNOW IN ADVANCE HOW TO ORGANIZE AND CONDUCT THEIR R&D JOINT VENTURES.

THE STANDARDS OR RULES REFLECTED IN H.R. 1952 ENSURE:

- OPEN MEMBERSHIP TO ANY ELIGIBLE U.S. FIRM (SEC. 4(B));
- THAT THE VENTURE'S JOINT ACTIVITIES ARE LIMITED TO R&D AND THAT EACH INDIVIDUAL MEMBER WILL BE FREE TO CONDUCT ITS OWN R&D AND CAN EXPLOIT VENTURE DISCOVERIES AS EACH SEES FIT (SEC. 4(C));
- FAIRNESS IN THE WAY THE VENTURE IS OPERATED AND MANAGED (SEC. 4(D));
- RAPID DISSEMINATION AND USE OF VENTURE DISCOVERIES, INCLUDING THE REQUIREMENT THAT EVEN NON-MEMBERS BE LICENSED AFTER THREE YEARS (SEC. 4(E)); AND
- PUBLIC AWARENESS OF THE EXISTENCE OF THE VENTURE AND THAT IT IS BEING OPERATED IN CONFORMITY WITH THE LAW'S REQUIREMENTS (SEC. 5).

IF A VENTURE COMPLIES WITH THESE STANDARDS, ITS ACTIVITIES WOULD NOT BE SUBJECT TO EITHER CRIMINAL OR TREBLE-DAMAGE LIABILITY. CONGRESS WILL HAVE DECLARED SUCH COMPLIANCE TO BE PRESUMPTIVELY LAWFUL. OF COURSE, ACTIVITIES FALLING OUTSIDE OF THE STANDARDS WOULD REMAIN FULLY SUBJECT TO THE DUAL DETERRENTS OF GOVERNMENTAL AND PRIVATE ACTIONS.

THIS APPROACH IS PREFERABLE OVER THAT CONTAINED IN THOSE BILLS WHICH WOULD REQUIRE ANY VENTURE TO BE "CERTIFIED" BY THE JUSTICE DEPARTMENT. WE DO NOT THINK IT EITHER NECESSARY OR DESIRABLE THAT ANOTHER BUREAUCRACY BE CREATED TO SOLVE THIS PROBLEM. WE WOULD PREFER A LAW THAT THE PRIVATE SECTOR COULD ITSELF UNDERSTAND AND APPLY. FURTHER, TO BE SUCCESSFUL, SUCH VENTURES MUST REMAIN FLUID, WITH STRATEGIC DECISIONS CONSTANTLY REVIEWED AND REDIRECTED IN LIGHT OF EXPERIENCE PROVIDED BY THE PROCESS. A RIGID CERTIFICATE AUTHORIZING CERTAIN DESCRIBED VENTURE ACTIVITIES IS WHOLLY INAPPROPRIATE TO THIS ENVIRONMENT.

BEFORE CLOSING, I WOULD LIKE TO EMPHASIZE THAT WE ARE NOT TALKING ABOUT A MASSIVE RESTRUCTURING OF THE ANTITRUST LAWS, BUT RATHER A RELATIVELY SIMPLE CLARIFICATION WHICH WOULD ENCOURAGE SHARPLY LIMITED, PRO-COMPETITIVE COOPERATION AT THE PRE-PRODUCT, PRE-MANUFACTURING AND PRE-MARKETING LEVEL. OTHER COUNTRIES HAVE OPTED FOR GOVERNMENT SANCTIONED AND DIRECTED CARTELS. THIS LEGISLATION STOPS FAR SHORT OF THAT, BUT GIVES U.S. COMPANIES--AND NOT JUST HUGE, DOMINANT ENTERPRISES--THE LEGAL ENVIRONMENT THEY NEED TO RESPOND.

WE URGE THE COMMITTEE AND YOUR COLLEAGUES IN THE HOUSE TO ACT FAVORABLY ON H.R. 1952, WHICH WILL MAKE A SIGNIFICANT CONTRIBUTION TO FOSTERING INCREASED R&D AND THEREFORE TO ENHANCING THE INTERNATIONAL COMPETITIVENESS OF U.S. FIRMS.

E. CONCLUSION.

THE DOMINANT CHARACTERISTIC OF THE ECONOMIC HISTORY OF THE LAST TWO DECADES HAS BEEN TECHNOLOGICAL CHANGE--TREMENDOUS ADVANCEMENTS HAVE OCCURRED AT A BLINDING PACE. THIS PACE CONTINUES, SUCH THAT WE NOW STAND AT THE EDGE OF A NEW ERA IN HUMAN HISTORY. SOME HAVE LABELLED THIS THE

"INFORMATION REVOLUTION" AND SAY THAT, IN YEARS HENCE, THE CHANGES IN OUR LIVES THAT IT BRINGS ABOUT WILL BE SIMILAR IN SCOPE TO THOSE RESULTING FROM THE "INDUSTRIAL REVOLUTION" OF A CENTURY AND A HALF AGO. HIGH-SPEED ELECTRONIC DATA AND WORD PROCESSING AND COMPUTER GRAPHICS WILL REVOLUTIONIZE WORK, EDUCATION, LEISURE--LIFE AS WE KNOW IT TODAY. RIGHT NOW, THE U.S. IS THE ACKNOWLEDGED WORLD LEADER IN COMPUTERS AND MICROELECTRONICS, JUST AS WE ONCE WERE IN TEXTILES, AUTOS, AND STEEL. BUT THERE ARE GRAVE THREATS TO THAT LEADERSHIP TODAY AND THE SOCIAL CONSEQUENCES OF INACTION ARE OMINOUS. WE NEED TO ENCOURAGE THE PRIVATE SECTOR TO TAKE STEPS THAT WILL REVERSE THE DETERIORATION THAT IS UNDERMINING OUR POSITION OF WORLD LEADERSHIP IN TECHNOLOGY. YET WE NEED TO DO IT IN A WAY THAT ENCOURAGES AMERICAN FIRMS TO CONTINUE AS INDEPENDENT COMPETITORS. GIVEN A CHANCE, COOPERATING U.S. FIRMS CAN PRESERVE AND ENCHANCE MULTI-ENTERPRISE FREE-MARKET COMPETITION WHILE EXPANDING THE EMPLOYMENT OPPORTUNITIES OF OUR CITIZENS, BROADENING THE CHOICES AVAILABLE TO OUR CONSUMERS, AND ENSURING THE PRESERVATION OF OUR NATIONAL SECURITY.

THANK YOU. I WOULD BE DELIGHTED TO RESPOND TO ANY OF YOUR QUESTIONS.

Mr. **Gore**. Thank you, Mr. Olson.

We have second bells for a vote on the floor. Cochairman Walgren and I are running a kind of relay here. We went over earlier and consequently there will likely be a delay of only 2 or 3 minutes before he is back to resume the hearing.

So with your indulgence we will take a very brief recess.

[Recess.]

Mr. **Walgren**. I apologize for the interruption and let us continue where you were.

Mr. Brodley.

STATEMENT OF JOSEPH F. BRODLEY, PROFESSOR OF LAW, BOSTON UNIVERSITY

Mr. **Brodley**. Mr. Chairman, the discussion has ranged far and wide but really the issue is narrow in terms of our focus on this legislation. It is the antitrust connection. Has antitrust hurt our trade effort by chilling research progress through joint ventures? I think the testimony has brought out that we deal not with the reality of antitrust doctrine but with perceptions and I don't say perceptions are not important, but it is, I think critical to bear that in mind.

And I think that it bears emphasis that the record of enforcement simply has not foreclosed these kinds of joint ventures.

Now, with respect to perceptions.

Perceptions in the antitrust world are changing. The antitrust law itself is in a process of change. Government enforcement is changing very dramatically as evidenced in the new merger guidelines. We heard of the necessity of judging markets from a world basis. The antitrust law is moving in that direction.

Plaintiffs in private actions face greater hurdles than they used to because of restrictive standing doctrines and other restrictive doctrines.

Evidence that perceptions are changing are the very fact of the MCC joint venture. It was difficult to be sure but it has been done and that will, itself, change further perceptions. We see a proposal now for a joint venture between General Motors and Toyota which is not a research joint venture at all. It is a production joint venture. That would not have occurred a few years ago, maybe even a couple of years ago. Further evidence of changing perceptions.

I think that before launching into legislation the Department of Justice could itself do more to make perceptions catch up with reality. I think they could develop a better review procedure in which they could issue more comprehensive rulings as to those joint ventures in the research field that are presented to them. I think they might indicate that they would use some of their resources to intervene which they are using very greatly to intervene in actions if such actions are ever brought against research joint ventures which they have approved on behalf of the defendants.

They are doing it elsewhere, why could they not do it in that area?

So I think they could do more. That is not the total answer, but I think we should recognize that.

Thus, I see a certain element of overkill in many of the proposals creating possibly a whole new jurisprudence in ousting the courts. Let me briefly review these matters and then present one alternative that has not quite been presented before.

Speaking to the proposals that are before you in the several pieces of legislation, they can be divided into a few categories. First there are those that would establish a general antitrust exemption, the Synar, the Mathias, the Tsongas proposals. These, it seems to me go too far because they would allow research concentration all the way up to cartels because they would institute to protect the public an elaborate array of procedures with access, licensing, and so forth and they do all of this when it may not be necessary to do so in the sense that there is no determination or finding that it is necessary to go that far.

Second, there is the possibility of an industry specific exemption. Not all industries require an exemption. A few do at the cutting edge. If that is so why not authorize a responsible agency to determine that such a need exists for high research collaboration and that connects with Dr. Baruch's proposal in the sense that this board made up of representatives of the two national academies might be just such an agency to make that determination.

That is not proposed but it could be that it would meet the need and it is much closer to the Japanese model than others that have been proposed.

The third broad area of suggestions is to reduce plaintiffs' litigation advantages through reduction to single damages, through elimination of anything but the rule of reason, through attorneys' fees for dependents.

Now, it seems to me such proposals both do too little and too much. They do too little in the sense that they still would not prevent what we hear is a main problem, nuisance litigation. Plaintiffs could still institute damage actions which we are told could chill and threaten a joint venture.

As to the per se and rule of reason, the rule of reason already applies and it would be a not very imaginative counsel who could not, somehow attach a per se claim of spillover, collusion, even if he brought the action against the research joint venture under the rule of reason.

But yet such proposals do too much because they begin something that concerns me a great deal. A piecemeal amendment of fundamental antitrust remedies. I think that is a bad precedent. I think there is a need before we do that for a much more searching sort of review. So I am later going to suggest one possible sort of modification of that statement but I am just very concerned about these broad sweeping proposals which could be precedents and we know they could be precedents because the administration is proposing a much broader change in antitrust remedies.

The fourth approach which is the comprehensive advanced ruling by the Department of Justice in the Edwards, Hyde and Mineta and Kennedy bills and is somewhat modified by the administration today. This, I think, is the most responsive approach to the stated need. It has the advantage of requiring no change in substantive standard of being transaction specific but it has some problems and I would like to address it briefly.

First of all the actual bills contain a major defect in that they do not require disclosure of the specific terms of joint venture agreement. That means that affected parties, competitors, customers, consumers would not be able to participate in an informed way before the Justice Department. Now Justice proposes that actually there be a publication to the public to the terms of the agreement. So I approve of that.

Let me summarize that the problem, it seems to me as stated is one of perception. It involves perceptions of treble damages. It involves the possible problem of latecomers who want to grab onto the joint venture and pick its fruits while not having contributed and there is a third problem which the committee has identified very nicely today, to solutions that we are talking about are unreviewable discretion for the Department of Justice and that has its problems.

Thus, let me suggest an alternative not previously mentioned toward research joint ventures. Why don't we apply the same approach we have applied to mergers. A joint venture is a partial merger of their research activities. It is subject to the Clayton Act already. Why not apply essentially the same procedure. That would mean that the Government could challenge it in an injunctive action or a private party could challenge it in an injunctive action. This would be done before the transaction has been consummated.

Mergers, of course, can be contested at any time but how many mergers are opened up later? There was once one called the Du Pont/General Motors case. That was an exceptional case. But you could go a little farther and this gets a little close to the proposal made by Congressman Zschau and I think also you, Mr. Chairman, touched on this a bit. But one could go a bit further and provide that litigation would have to be commenced at the outset by either the Government or private litigant and one might also make attorneys' fees payable by the losing party to add a little bit of sting to the assertion of claims and expedited hearing as I think you suggested, Mr. Chairman. I think that is quite within the domain of the possible.

It presently occurs in merger cases. Of course, that is under the constraint that the parties need to act soon but that is not a legal constraint and yet it is happening. It seems to me you could easily handle by legislation something which is happening anyway in mergers where courts are responsive to the needs of the parties. And I think there has been too little expression of confidence in courts that courts when fully advised and informed will not act properly.

There is finally a possibility which I think you ought to also carefully consider which is deferral of legislative action now and further study. Congressman Sensenbrenner in his bill called for a study and Congressman Lloyd too in their bill called for a study after 18 months. I think that evidences the problem. Maybe there should be more study now because partly there are so many different proposals and also because research joint ventures are part of a larger problem, tax policies, trade policies, Government subsidies, and so forth.

We have no assurance this is the solution and to put the energy into this solution may be to deflect others which are really more important in reaching the goal which we all seek and I think we see that particularly in an administration proposal which is to expand the scope of this a great deal.

So, I see wisdom in further study by this committee as it is now doing and possibly by a panel of experts or even a national commission.

Thank you.

[The prepared statement of Professor Brodley follows:]

STATEMENT OF JOSEPH F. BRODLEY

Several bills have been introduced that would under specified conditions exempt research joint ventures from the antitrust laws. To provide the Committee with an assessment of that legislation it is necessary to consider three questions: (1) What is the underlying problem to which the legislation is addressed? (2) How is that problem linked to antitrust enforcement? (3) Assuming such a linkage, what are the various policy alternatives and what are their respective costs and benefits?

I. UNDERLYING PROBLEM TO WHICH LEGISLATION IS ADDRESSED

The basic problem which gives rise to the several proposals that would alter the relationship between the antitrust laws and research joint ventures is the growing challenge to U.S. technological leadership. This is reflected in the decline in the U.S. share of world exports of manufactured goods, including technology intensive goods. Arguably, a cause of this decline is the relative decrease in the U.S. share of G.N.P. devoted to research and the diminishing growth rate for R&D scientists and engineers employed in the U.S. as compared with other countries. *See* U.S. Commerce Department, *An Assessment of U.S. Competitiveness in High Technology Industries* (1983).

The various factors mentioned, all of which of course could impact U.S. technological leadership, do not represent new problems, nor have they been unrecognized in the past. Indeed, responding to many of the same concerns, President Nixon in his Special Message to the Congress on Science and Technology in 1972 proposed a partnership between government, universities and private enterprise to encourage research. See Special Message to the Congress on Science and Technology, 1972 Public Papers of President Nixon, 416 (March 16, 1972). But in the intervening ten years we have seen our position erode in world markets where we were previously dominant, as in automobiles, or challenged, as in computers.

The problem for this hearing, however, is not the decline in the U.S. share of world manufacturing exports as such, but whether (1) declining manufacturing exports are due to diminished research effort, and whether, if that is so, (2) overzealous antitrust enforcement has caused such lessening of research effort. In response to the first question, it is by no means clear that the relative decline in U.S. exports stems from diminished research, but I am willing to assume that any decline in the growth rate of research is a cause for legitimate concern given the correlation between R&D inputs and technological innovation. See Schmookler, Invention and Economic Growth (1966). Thus, the ultimate question, as I see it, is whether the antitrust laws as presently enforced have inhibited desirable research effort through joint ventures.

II. ANTITRUST ENFORCEMENT AND R&D INVESTMENT

Enforcement of the antitrust laws assertedly inhibits R&D investment because it limits joint research activities between competitors and potential competitors. Inability to form joint ventures assertedly inhibits research in two ways. First, limitations on joint research prevent the achievement of research economies of scale, which arguably requires a greater concentration of firms than does the achievement of production economies. Second, limitations on joint research prevent firms which innovate in fields that are not fully covered by patents from capturing the full benefit of their innovation. Instead, they must share the benefits with "free riders," who simply copy the successful innovation without having borne any of the research cost. Because this lowers the return to innovation, firms arguably devote fewer resources to research.

There are two problems with this asserted adverse relationship between antitrust and R&D investment. The first is that the correlation between firm size and research is weak. The second is that antitrust enforcement against R&D joint ventures has been modest.

Empirical research provides little support for the existence of large scale economies in R&D beyond relatively low thresholds of firm size and concentration levels. Size up to about $250 to $400 million in sales appears to have a positive effect on research. Findings are mixed as to whether size above this level confers identifiable benefit (with the exception of exceedingly complex projects, such as have occasionally occurred in the chemical industry). Cf. F. SCHERER, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 422 (2d ed. 1980). Similarly, researchers have reached no concensus whether there is a relationship between concentration or market share and research productivity. See generally M. KAMIEN & N. SCHWARTZ, MARKET STRUCTURE AND INNOVATION 91 (1982). Nor do the economic studies establish that the inability to capture the full benefits of research explains the relative lessening of U.S. research expenditures. At most it is a matter of conjecture that the decline in research expenditure is due to a fall off in the private as compared with the social return from innovation. See Scherer, R&D and Declining Productivity Growth, 73 Amer. Econ. Rev. 215 (1983).

To the student of antitrust law assertions that antitrust enforcement has stymied research joint ventures have a peculiar ring since enforcement has been exceedingly modest. A pure research joint venture without ancillary restraints has never been challenged by the Antitrust Division. Even as a matter of theory, the Division would raise no objection to a joint venture involving basic research unless it included the entire industry. Even when a joint venture involves applied research, the government would object only if the joint venture included a group of firms having high market share. See Antitrust Guide Concerning Research Joint Ventures U.S. Dept. of Justice (1980); Brodley, Joint Ventures and Antitrust Policy, 95 Harv. L. Rev. 1521, 1570-73 (1982).

The argument that the antitrust laws inhibit research joint ventures rests much less on the risks of government enforcement than on the hazards of private enforcement. The ease with which an antitrust cause of action can be stated, the heavy expense of antitrust litigation and the risk, even if small, of heavy triple damages or crippling injunctions arguably has a chilling effect on the formation of research joint ventures. The force of the argument is limited, however. First it is based on assertions, rather than empirically validated propositions. Second, even if adverse effects occurred in the past, antitrust law is becoming substantially more permissive, and this is particularly true in the field of joint ventures.

To summarize, the decline in R&D investment is, at most, only weakly linked with joint venture antitrust enforcement. Whether this state of affairs justifies legislative intervention is problematic, and most clearly it justifies no radical antitrust surgery.

III. LEGISLATIVE ALTERNATIVES

The rich menu of legislative proposals and alternatives can be divided into five broad categories. These include (1) a general exemption for research joint ventures, (2) an industry-specific exemption based on identified research need, (3) the lessening of plaintiffs' advantages in antitrust litigation, (4) the reduction of antitrust uncertainty through comprehensive advance rulings by the Justice Department and (5) the deferral of legislative action to allow further study of the problem. Not all of these possibilities are reflected in the pending bills, and several bills advance more than a single objective. But by focusing on these broad policy goals, it is possible to clarify our analysis.

A. General Exemption for Research Joint Ventures

Several bills would establish a broad antitrust exemption for qualifying research joint ventures. These include the Mathias (S. 737), Synar (HR 1952) and Tsongas (S. 568) bills. These bills exempt qualifying research joint ventures from the antitrust laws with no restriction as to the market share of the participants (although particular procedures may be involved for high market share groups). The antitrust exemption applies without regard to whether individual research efforts are deficient or lagging or whether the research is fundamental in nature with no immediate commercial application or applied research with high near term commercial value. Finally, both participants and nonparticipants are guaranteed access to the joint venture and to the discoveries that it produces.

The disadvantage of these proposals is that they would permit concentration of research, including research cartels, even when there is no need for such concentration. In order, therefore, to protect the public and industry members from the possible excesses that such concentration might cause, the proposals establish an elaborate array of procedures that are potentially anticompetitive and also litigation-inviting. Thus, access provisions reduce the incentive for competitive research even when competitive research is fully viable; rigid limitations on the term of the joint venture's existence or the period of exclusive access confine the joint venture when a longer term would be more efficient and would do no competitive harm; and, provisions for nondiscriminatory access and licensing of joint venture research on reasonable or fair terms invite dispute and future litigation.

Although the antitrust exemption is limited to research and the Attorney General is given authority to approve and/or revoke the exemption if the joint activities spill over into other areas, these limitations do not sufficiently protect vital antitrust interests. Success of a research joint venture, indeed of any joint venture, requires a free and ongoing exchange of information between the participants. But information and ideas are a seamless web, and there is no effective means of assuring that potentially anticompetitive information is not exchanged without stultifying the joint venture. That is a risk that may be worth assuming if there is no means to evoke indispensable research except by allowing a large share of an industry to engage in joint research, for in that event the potential benefits may exceed the competitive costs. The problem with the general exemption approach is that it assumes the competitive risk without any determination that the particular research benefits likely to ensue justify taking that risk.

B. Industry-Specific Exemption Based on Identified Research Need

An alternative to the general exemption just discussed would be an industry-specific exemption resting on a determination that socially vital research requires the joining of research effort in a particular industry. Based on such a finding the scope of the exemption could then be tied to the specific research need. The size of the research group, provisions for access, antitrust scrutiny, organization and management of the joint venture all could be tailored to the particular case.

None of the legislative proposals appear to follow this approach, but it should be carefully considered as an alternative to a general exemption. The industry-specific exemption avoids the problems of global misjudgment, such as may result from broad provisions that provide for compulsory licensing after three, six, or some other arbitrary number of years. It has the disadvantage, however, that it requires a public agency to determine that individual research plus joint research within the scope of the antitrust laws are insufficient to meet vital research needs. But if that determination is difficult for a specific industry, how much more difficult must it be to make the global judgment that a general antitrust exemption is required.

C. Lessening of Plaintiffs' Advantages in Antitrust Litigation

Several bills contain provisions that would reduce antitrust damages, or otherwise restrict the advantages accorded plaintiffs in antitrust litigation. These include provisions which would be applicable to research joint ventures: the limitation of antitrust damages to single damages (in the Edwards and Administration proposals); the preclusion of the per se rule (in the Administration proposal); and the several proposals to make attorneys fees payable by the plaintiff under certain circumstances. All of these proposals are undesirable because they undertake basic change in the remedial structure of the antitrust laws without assurance that such change will solve the specific problem to which the bills are addressed. Yet such change could have serious implications for the development of antitrust law generally.

The essential problem to which all of the proposals respond is the possible overdeterrence of desirable research joint ventures. While a reduction in plaintiffs' antitrust advanges reduces the attractiveness of antitrust litigation and thus might appear to be a step in the right direction, it still permits a determined plaintiff to throw a joint venture into protracted litigation on the assertion of a colorable claim. Damages and possibly draconian injunctive relief that could disrupt the joint venture continue to be available. Moreover, a resourceful plaintiff would often be able to allege a spill over of collusion into a non-joint venture area such as to allow the joinder of a treble damage claim. As for the proposal to limit the application of the per se rule, the rule of reason is already the governing standard for research joint ventures, and to amend the statute to state that this is the case would be both redundant and unduly interfering with the judicial role, while at the same time it would not prevent plaintiffs from asserting spill over collusion and joining of per se claims.

The proposals to reduce plaintiffs' advantages in antitrust litigation thus do not solve the problem to which they are addresed, because plaintiffs could still institute burdensome lawsuits. At the same time such proposals would begin a piecemeal amendment of fundamental antitrust remedies that would set an undesirable precedent. That kind of basic change should come only after searching study of the modern function of the antitrust laws and their remedies.

D. Reduction of Antitrust Uncertainty Through Comprehensive Advance Rulings by Justice Department

The antitrust laws conceivably chill the formation of research joint ventures not because of overly stringent legal doctrine or government enforcement, but from the risk of private and perhaps state-instituted litigation. At least two of the bills (Glenn-Kennedy and Edwards) attempt to meet this problem directly by authorizing the Justice Department to issue rulings that would give immunity not only from suit by the federal government, but also from suits by private litigants and state governments.

This proposal does not change antitrust standards, but attempts simply to protect research joint ventures from unfounded antitrust litigation. If we accept that risks of private (and state) litigation have an asserted chilling effect, this approach is highly preferable to the other proposals. It is by far the simpliest of the approaches and that is always a legislative virtue. In addition, it is transaction-specific. The Justice Department can focus entirely on the specific joint venture at hand. If the joint venture presents antitrust risk, the Department can shape particularized remedies, which may include some or all of the restrictions and controls contained in the more comprehensive bills.

There is one important defect in the proposal, however. It does not require the specific terms and substance of the joint venture agreement to be disclosed to the public prior to approval. This prevents concerned individuals and groups other than the actual participants from making fully informed presentations to the Department. In view of the broad immunity to be given, the Department should be informed not only by the presentations of in the joint venture participants, but also by the analysis and views of concerned nonparticipants, including competitors and potential competitors, suppliers, customers and public interest groups. But the comments of outsiders cannot be fully informed unless based on the actual facts of the proposed joint venture, including the agreement between the participants. An appropriate disclosure requirement could follow the language of the Mathias and Synar Bills, which in their notification procedure require disclosure of the identity of participants, the proposed research program and the agreements entered into between the participants.

E. Deferral of Legislative Action

A final legislative option is to take no action at this time, but instead to undertake further study. The justification for further study is insufficient documentation of legislative need. The showing thus far made rests heavily on the claims of a particular industry which has nevertheless managed to form a research joint venture. This is not to say that the claim that antitrust enforcement has constrained research progress is necessarily without foundation. But thus far the case is more one of assertion than proof. A viable alternative would be to desist from making changes at this time, and instead to undertake a comprehensive study, perhaps conducted by a bipartisan commission. One indication that this could be fruitful is the wide divergence between the various legislative proposals, a condition that suggests that the problem is not yet well defined.

Deferral of legislative action on joint ventures avoid the risk of piecemeal change. The problem of lagging research effort calls for a variety of responses. Surely no one contends that a research joint venture bill is the total solution, for tax policy, trade barriers, patent and trade secret protection, scientific education support and government subsidy may all play a role. There are advantages in looking at the research problem as a whole and devising a comprehensive approach. As one example, differing policies directed at a common goal may have interactive effects such that one policy step may interfere with another and thus optimal progress will be achieved by adopting less than the total set of policy proposals. From this more comprehensive perspective, a research joint venture bill may or may not appear to be a desirable step. Thus, a cautious approach to research joint venture legislation is not without advantages.

Mr. **Walgren**. Thank you very much.

I have to ask your indulgence for another 10 minutes. I am sorry. Those bells are there and I get criticized if I don't vote and there is no other member to keep the hearing going. So I just have to ask your indulgence.

[Recess.]

Mr. **Walgren**. The next witness will be Mr. Sobel.

STATEMENT OF GERALD SOBEL, PARTNER, KAYE, SCHOLER, FIERMAN, HAYS & HANDLER

Mr. **Sobel**. Thank you, Mr. Chairman.

I am delighted to be here. I will abbreviate my written statement.

No one that I have heard today questions the desirability of innovation. Economic studies show that technological progress has been an important factor in our economic growth and it seems to be pretty well agreed here also that innovation is important competitively.

While it has not been stated today innovation—or perhaps it has in a sense but innovation can change market position and shake up competition and competitors in a way that no other form of competition can accomplish. Price and product differentiation and service competition are much less dynamic than competition in the form of innovation and in an artful phrase, Joseph Shumpeter called it, describing the American economy, a "gale of creative destruction." He was talking about when one technology just pushes out another and takes over a market and that is a very powerful thing from a competitive point of view as well as from an economic growth point of view.

It is clear also from what I have heard today that it is widely agreed that innovation is risky. It is also costly and a time-consuming endeavor. It requires originality, persistence, money, manpower and as you get toward prototypes and then commercialization the costs mount sharply and failure is always a risk.

Now, it is obvious that joint research offers a way to spread the risk. It offers a way to spread the costs and if it works to achieve the benefits of innovation that we have heard about.

Since joint research arrangements are by definition combinations, they get tested under the portion of the Sherman Act which, as we have heard, applies a "rule of reason" standard. And that means that you have to consider the history, the purpose, the effect of the arrangement and you have to determine whether on balance it promotes competition or suppresses competition unreasonably and that does not lead to easily predictable results.

There is a high degree of uncertainty in trying to figure out whether a particular arrangement will be lawful or not lawful.

A practical irony here is that the likelihood of such an arrangement being attacked is greatest if the venture is successful. If it comes up with something worth while which materially contributes to economic growth and which actually shakes up the industry competitively those are the ones that the plaintiffs' lawyers will go after because that is where the potential for showing some damages exist.

And it is only after such an antitrust case is brought and tried probably years after the joint research program that the participants know where they stand, whether they violated the law or have not violated the law. And while I cannot point to rigorous empirical data which shows that this deters joint research, I do believe based on my practice that the risk of governmental investigation, of antitrust attack, of the associated liability, first of all they are certainly considered by the joint venturers and I believe that they necessarily present an obstacle to going forward with joint research.

I would like to illustrate with two actual decided cases.

First is the SCM Corp. major antitrust case against Xerox in which I was personally involved on behalf of Xerox. This illustrates long delayed antitrust exposure of the kind that joint research venturers confront.

The Xerox situation as everybody knows who watched the stock market in the 1960's presented a classic case of a successful innovation. Joint research happened to be a part of the development process. Xerox started its research in development work on Xerography in 1947 and worked continuously thereafter to develop the Xerographic process and a copier. In 1960, Xerox introduced its first plain paper copier. That was a big success. Improved machines followed. In 1973, SCM started its antitrust suit against Xerox complaining about its research and development activities among other things. SCM claimed after trebling $1.5 billion and sought to break up Xerox.

That was 26 years after Xerox started its R&D work. It was 13 years after the first Xerox copier was introduced. The parties conducted discovery, prepared for trial for 4 years. The trial before a jury lasted 14 months, essentially every weekday. Xerox won after trial, prevailed on appeal, certiorari was denied by the Supreme Court and the case ended in 1982, 35 years after Xerox began its Xerographic work.

Now that is what antitrust exposure means. That is what the rule of reason permits and that is a heavy burden to bear.

Now there is another aspect of the heavy burden that the risk takers are confronted with.

In addition to this delay in exposure, the antitrust laws create the potential for decisions which actually would discourage innovation and even procompetitive behavior and this is illustrated by the case brought by Berkey, a camera company, against Eastman Kodak, and I should say as an aside that Mr. Stein, who is sitting on my right, I know was counsel for the plaintiff in that case.

Berkey, among other things, challenged Kodak's joint development programs with individual lamp manufacturers of new camera and flash device combinations. Berkey said that Kodak, allegedly a monopolist, refused to permit the lamp manufacturers with whom Kodak was working to make disclosures to camera competitors of Kodak including Berkey, about the new research program and the product to be developed.

And the complaint was that the lamp manufacturers were prevented from making these disclosures in advance of the time the new product was introduced.

The court gave the jury a charge under the rule of reason. I will read you this: The jury had to decide whether "under the circumstance so legitimate objectives of the programs might have been achieved by alternative means with less restrictive effects including predisclosure or provisions for royalty-free licensing."

On this issue the jury found for Berkey. The court of appeals affirmed on the basis that this charge to the jury was not wrong and while I have heard it repeated several times today that no joint research arrangement has ever been successfully attacked this is one that has.

So I cannot square what I have heard with this instance.

Now what does this imply? It is not clear, first of all, that a similar rule would apply to different facts. It is not clear even that a different jury with the same case before it would have come out the same way but it does create the concern that joint ventures may be the subject, as I said of judicial decisions which are neither proinnotative or procompetitive.

Why? Because the disclosure and licensing of technological developments by the people who make them, the competitors tend to negate the competitive value of the development. It is the prospect of that competitive advantage which is what motivates the venturers to do the joint research in the first place. If they don't have the exclusive right to enjoy the fruits of the venture and borrowing from the *Berkey* case even for the limited case before product introduction, then they may not bother with the innovation at all.

Now, I believe that that fear of being compelled to disclose or to license does kill some joint research arrangements all by itself.

Now, if others in the industry expect access to their competitors joint research results obviously they are less likely to do their own research. That is the so-called free rider concept.

I suggest legislation which has certain characteristics. First, the notice of the joint venture idea which would provide automatic clearance subject to a short waiting period and a negative reaction by the responsible agency which, if it could be the attorney general but if his department is understaffed it could be the Federal Trade Commission.

H.R. 1952 has a notice provision of this sort and Assistant Attorney General Baxter in his oral legislative proposal today indicated a filing notice concept also in his own suggestion.

Second, I would eliminate all antitrust exposure, private and governmental and that is also along the lines of the immunities in H.R. 1952 and H.R. 3393. And if Assistant Attorney General Baxter's proposal this morning includes a short waiting period before which he has to act to bring his injunctive action on behalf of the Government, that would come out in the same place as I heard the Assistant Attorney General's remarks; he was vague on that time period. He said something about it, but it was not clear that he would be cut off from thereafter challenging if he did not act within whatever the time period, 30 or 60 days.

Third, in order to preserve the incentive of firms to conduct the joint research and get the competitive advantage I spoke about and also to encourage competing lines of research in a given industry, it should not, I think, be a requirement that all members of industry be invited to participate. And this is contrary to one of the provisions in H.R. 1952 which would invite in at least all U.S. companies.

The fourth item is, as I implied, I would not require that the results of a joint research arrangement be licensed to third parties, at least not for some time. And that some time should be measured from commercialization, not from the date of access by the joint venturers as H.R. 1952 and H.R. 3393 provide because the time when the venturers get their award is after they have commercialized and that can be separated from conception by quite a number of years.

A further option which I borrowed from the Rome Treaty of the European Economic Community is to make a factor in the antitrust balancing process, the rule of reason balancing process technological and economic progress and consumer welfare and H.R. 3393 comes closes to that by referring to improving the national economy or furthering the national security as factors to be weighed under certain circumstances.

Finally, I think we can look to the patent system for a parallel to what we are talking about. The patent system offers certain exclusive rights because the policy is we want to promote innovation and that gets the patentee certain exemptions from the antitrust laws.

Here, you would be moving the balance toward the joint research venturers in the same way, giving them some rights because it is decided by Congress and these committees that joint research and innovation and the benefits which flow from it are worth having.

[The biographical sketch and prepared statement of Mr. Sobel follow:]

Gerald Sobel, Esq.

Biographical Statement

Gerald Sobel is a partner at the law firm of Kaye, Scholer, Fierman, Hays & Handler. His specialties include antitrust, technology matters and litigation. By way of illustration, he successfully represented Xerox with respect to the patent and technology issues in the year-long antitrust jury trial, SCM Corp. v. Xerox Corp.

Mr. Sobel is also an adjunct associate professor of law at the New York University Law School where he teaches a graduate course which he created on antitrust, patents and technology.

Mr. Sobel has been active in chairing and lecturing at continuing legal education programs on antitrust, trial, patent, and licensing topics. Some of his recent programs were the following:

Trial of a Patent-Antitrust Case (ABA Antitrust Section Patent-Know-how Committee and Private Litigation Committee Meetings; New York Patent Law Association, 1983).

Recent Developments in Licensing (Licensing Executives Society, 1982).

Chairman, Trying, Preparing and Controlling Antitrust Cases (New York Law Journal Seminar, 1981).

Chairman, Trial and Preparation of Major Antitrust Cases (New York Law Journal Seminar, 1980).

Antitrust Restrictions on Domestic and International Licensing (Practising Law Institute, 1980).

Chairman, Antitrust, Technology and Patents (New York Law Journal Seminar, 1980).

Mr. Sobel has also published various articles relating to antitrust, patent, litigation and joint venture issues. This fall, two of his articles are slated for publication: Reexamining the Extra Burden Imposed on a Patentee Who Seeks a Preliminary Injunction in the American University Review, and The Confidential Communication Element of the Attorney-Client Privilege in the Cardoza Law Review. Among others, he has also published the following: The Department of Justice's New 'Antitrust Guide Concerning Research Joint Ventures' Recht der Internationalen Wirtschaft, 298, May, 1981; Applicability of Antitrust to Combinations Under Bank Merger Act, Federal Power Act and National Gas Act, 37 New York University Law Review 735, 1962; Prior Art and Obviousness, Journal of Patent Office Society 79, 1965.

He is the Chairman Designate of the Patent, Trademark, Copyright Committee of the International Law Section of the American Bar Association.

Mr. Sobel is a member of the New York Bar and is admitted to practice in the United States Court of Appeals for the Second Circuit, the United States District Courts for the Southern and Eastern Districts of New York, and the United States Patent Office.

Mr. Sobel received his law degree from the New York University School of Law in 1963 where he was a member of the Law Review and an Arthur Garfield Hays Fellow. Mr. Sobel has a B.E.E. (electrical engineering) from the City College of New York (1960) and an M.A. in economics from the New School for Social Research (1973).

Eliminating Antitrust Obstacles to Joint Research

Testimony of Gerald Sobel at Joint Hearings
of Subcommittees on Investigations
and Oversight and Science,
Research and Technology of the
House Committee on Science and Technology
June 30, 1983

Introduction*

Innovation has been identified as a major source of American economic growth by economists, and is universally recognized as an important basis of competitiveness in international markets. It is, however, a risky undertaking that needs to be encouraged. A good way to reduce the risk and cost inherent in innovation is to spread research and development efforts among two or more joint venturers. In this country the uncertainty of exposure to antitrust liability for joint research activities tends to discourage such ventures. New legislation which would provide for a binding advance determination of a joint research venture's legality under the antitrust laws and exclusive rights to the technological results of an approved venture would mitigate this problem.

The Importance of Innovation and Joint Research

Economic growth in the United States had traditionally been attributed to the shift in the allocation of resources from labor to capital in the production process. Since World War II, however, studies have shown that technological progress has been a much greater factor in causing economic growth than intensification of the use of capital.[1]

Innovation is a risky, costly and lengthy endeavor. The search for technological advance requires originality, persistence, money and manpower. As the process is pursued towards the development of prototype products or processes and the commercialization of new products, the resources required mount sharply. The risk of failure is ever-present.

Given the risks, methods of reducing the cost and risk of innovation will be attractive, both for those engaged in the research and development process and for our economy. Joint research programs offer these benefits. The Japanese experience with such programs is an excellent illustration. To take a notable example, joint research efforts were organized in the Japanese microchip industry in 1976.[2] These apparently focused upon fundamental design and manufacturing technologies which contributed to significant production efficiencies.[3] By 1978, Japanese companies announced the first 64,000 bit random access memory chip, four times the capacity of the prior state-of-the-art chip.[4] According to newspaper reports, Japanese firms supply two-thirds of the United States and world requirements of such chips.[5] In another area, a joint research program is being launched by the Japanese to develop fifth generation computer systems.[6]

Antitrust and Joint Research

Since the enactment of the Sherman Act in 1890 the United States has developed a strong antitrust policy. As part of this policy, the Sherman Act, in an effort to foster competition, forbids combinations among companies which unreasonably restrain trade and monopolies which are unlawfully acquired or maintained.[7]

Since successful innovation is perhaps the best way to outdo competitors, innovation has often been favorably treated in antitrust jurisprudence. Innovation has the potential to change market position and even market definition in fundamental ways that the more static forms of price and product differentiation competition which characterize much of our economy rarely approach. Joseph Schumpeter, in his 1950 book on American capitalism, aptly called the technological change which characterized the American economy a "gale of creative destruction."[8] Thus, the Supreme Court has made clear that the achievement of monopoly power by "a new discovery or an original entry into a new field"[9] or "superior product [or] business acumen"[10] is lawful.

Uncertainty in Application

Since joint research ventures are, by definition, combinations their legality is tested under the combination portion of the Sherman Act.[11] The standard of legality under this statute is the "Rule of Reason." This test is less clear in its sympathy for innovation and considers the history, purpose and effect of the restraint to determine whether, on balance, it "promotes competition" or "suppresses competition" unreasonably.[12] Factors which have been considered in assessing a joint research venture include:

> "the size of the joint venturers; their share of their respective markets; the

> contributions of each party to the venture and the benefits derived; the likelihood that, in the absence of the joint effort, one or both parties would undertake a similar project, either alone or with a smaller firm in the other market; the nature of the ancillary restraints imposed and the reasonableness of their relationship to the purposes of the venture."[13]

Assessing these Rule of Reason factors and deciding whether the venture is, on balance, procompetitive or anticompetitive does not lead to easily predictable results.

As a result, when companies wish to undertake a joint research program, they face considerable uncertainty as to whether or not it will be lawful. The Government may challenge the arrangement as an antitrust violation, even after the venture is underway or completed. Similarly, a private party, perhaps a competitor, asserting injury by reason of the arrangement, may challenge it on similar grounds and claim the treble damages available as a remedy under the antitrust laws.

A practical irony is that the likelihood of attack of a joint research venture is greatest if the venture has been successful in developing something commercially valuable. Only after a case is brought and tried -- perhaps years after the joint research program -- do the participants know where they stand. While rigorous empirical data establishing that this situation deters joint research is not available, the risk of governmental investigation, antitrust attack and of the associated liability must be considered by the joint venturers and, therefore, necessarily presents an obstacle.

Long-Delayed Legal Exposure

SCM's major antitrust case against Xerox, in which I was one of Xerox' defense counsel, is a good illustration of long-delayed antitrust exposure.[14] It presented a classic case of a successful innovation, and joint research was a part of the development process. Xerox started its research and development work on xerography in 1947 pursuant to a license from Battelle, a research institution, that had obtained patent rights from the inventor of the xerographic process, Carlson. Xerox worked continuously thereafter to develop the process and copying machines using the process. In addition to its own research and development work, Xerox sponsored research at Battelle and, for a time, Battelle underwrote some of its own xerographic research. Many patents were obtained on the results of the research. Pursuant to licenses to Xerox, Carlson and Battelle had a royalty interest in the process. Then, in 1956, in return for transferring title to certain patents to Xerox, they obtained stock in Xerox.

In 1960, Xerox introduced the first plain paper copier, which was protected by patents owned by Xerox. The copier was a commercial success. Improved machines followed.

In 1973, twenty-six years after Xerox launched its xerographic research and development effort, thirteen years after Xerox brought out its first xerographic plain paper copier, and well after Xerox had made a success of that product and more advanced ones, SCM started its antitrust suit.[15]

The parties conducted discovery and prepared for trial for four years, and then the case was tried for over a year. Xerox won the case after trial and prevailed on SCM's appeal. Certiorari was denied by the Supreme Court, ending the case in 1982, nine years after it was started -- thirty-five years after Xerox began its xerographic work.

Concern For Anti-competitive, Anti-innovative Results

In addition to uncertain and long delayed legal exposure, the antitrust laws create the potential for judicial decisions which tend to discourage innovation, as well as procompetitive behavior. This is illustrated by the case brought against Eastman Kodak by Berkey, a camera competitor.[16] Berkey, among other claims, challenged Kodak's joint development programs with individual lamp manufacturers of new camera and flash device combinations. Berkey argued that Kodak refused to permit the lamp manufacturers to make disclosures to camera competitors of Kodak of the new products in advance of their introduction and that this placed Berkey at a competitive disadvantage. The Court instructed the jury to apply the legal standard of whether:

> "under all the circumstances, the legitimate objectives of the programs might have been achieved by alternative means with less restrictive effects, including predisclosure or provisions for royalty-free licensing."[17]

The jury found for Berkey on this issue, and the Court of Appeals for the Second Circuit affirmed on the basis that the jury charge was not erroneous. In sustaining this charge the Court of Appeals stressed the fact that Kodak had been found to be a monopolist in the camera market and referred to "Kodak's arguably mininal technological contributions to the two projects."[18]

This outcome stimulated an unusual dissenting opinion in connection with the Supreme Court's denial of certiorari in Berkey.[19] Kodak had not petitioned for certiorari on the joint research issue, but Justices Rehnquist and Powell volunteered that it was "little less than bizarre" that Kodak might have an obligation to disclose the details of its joint research ventures prior to product introduction "even though Kodak made an investment of millions of dollars in the project that presumably was essential to its success."[20] According to these Justices:

> "To one not schooled in the niceties of antitrust litigation, the notion that a statute designed to foster competition requires one competitor to disclose to another, in advance of marketing a product to the general public, its plan to introduce the new product, is difficult to fathom."[21]

While it is not clear that a similar rule would apply to a different fact situation or even that a different jury would reach the same result in the Kodak case itself, the outcome in the case creates the concern that joint ventures may be the subject of judicial decisions which are neither pro-innovative nor pro-competitive. The disclosure and licensing of technological developments by those who made them to competitors tends to negate the competitive value of the developments. Yet the prospect of such a competitive edge is what fueled the innovative effort in the first place. If the exclusive right to enjoy the fruits of a joint research venture -- even for the limited time before new product introduction -- may be denied to the venturers, then the venturers may not bother with the innovation at all. Moreover, if others in the industry expect access to their competitors' joint research results they are less likely to conduct their own competing research. The result may be to discourage both innovation and the competition represented by the effort to gain a technological edge over competitors.

The Existing Antidotes

The deterrent effect of the antitrust laws was recognized in President Carter's 1979 message concerning initiatives to promote innovation.[22] He directed the preparation of a Guide by the Antitrust Division of the Department of Justice which was to clearly explain its position on the subject of collaboration among firms in research.[23]

Such a Guide was published in November 1980.[24] It described the analytical framework of the Antitrust Division's approach to assessing the legality of joint research ventures by identifying pertinent factors in three areas:

1. The effect of the venture in lessening existing and potential competition between participating firms;
2. Specific restrictions upon competitors; and
3. Limitations on access to the results of the joint research by others than the venturers.[25]

While the Guide reflects a general respect for innovation as a pro-competitive force,[26] no calculus defines how the pertinent factors are to be weighed. The Guide thus underscores the uncertainty in the application of the antitrust laws.

A business review program now in place at the Department of Justice offers review of proposed activity but, at best, merely culminates in a statement by the Department of Justice of its then present enforcement intentions.[27] While clearance under this procedure suggests that the chances of a subsequent government suit are slight, it does not preclude such action.[28] The FTC has similar procedures.[29] Neither clearance, moreover, is a defense in private suits.

A Proposed Remedy

In order to remove the antitrust deterrent to otherwise very desirable activity, joint research venture participants should be able to obtain full legal clearance in advance of their program and, if the program is cleared, a charter which permits exclusive enjoyment by them of the technological fruits of the venture.

As for definitive application of the antitrust laws at the outset, it would not be a sharp departure from existing law to assess the legality of a joint research venture at the time it is organized. Thus, in the Xerox case the Court of Appeals for the Second Circuit specifically held that, in the analogous situation of the acquisition of a patent, legality was to be determined in light of the circumstances at the time of the acquisition rather than later, at the time of the subsequent suit.[30]

Legislation should be enacted to create a vehicle for advance binding legal clearance and also to clarify the right to exclusivity. Such legislation should satisfy certain basic criteria:

1. In order to provide a vehicle for advance clearance, application, at the venturers' option, for approval of the research and development program should be to the Attorney General or, in the alternative, to the Federal Trade Commission. Alternatively, notice to the Government of the venture could provide automatic clearance, subject to a waiting period and possible disapproval by the responsible agency.

2. To remove the cloud of antitrust exposure, approval should free the venturers from exposure to all criminal and civil actions, governmental or private, for violations of the federal antitrust laws or analogous state laws as long as

the conduct in question is covered by the governmental approval.

3. In order to preserve the incentive for firms to conduct the joint research and achieve a competitive advantage, and also to encourage competing lines of research in the pertinent industry, it should not be a requirement that all members of an industry be invited to participate in an approved joint research venture.

4. For the same reasons, the participants in an approved joint research venture should be entitled to enjoy exclusive rights to the technology resulting from the venture, if not permanently, at least for a significant period.

A further option, which would underscore the priority to be accorded innovation in the antitrust balance, would be to expressly provide that, in assessing the legality of joint research ventures, the promotion of technological and economic progress and consumer welfare should be considered.[31]

A precedent for the grant of exemptions from the antitrust laws by the Attorney General of joint arrangements which serve an important public policy goal is found in the Newspaper Preservation Act.[32] It exempts certain joint newspaper operating arrangements which serve to save struggling newspapers from financial failure.[33]

The legislation described above would reduce the antitrust deterrent to joint research and, in the process, stimulate invaluable innovative activity.

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[1] *See* F.M. Scherer, Industrial Market, Structure and Economic Performance, 407-08 (2d ed. 1980) (citing Denison, Accounting for United States Economic Growth, 1929-1969, 131-37 (1974); Solow, *Technical Change and the Aggregate Production Function*, Rev. Of Econ. and Statistics, 1957, at 312).

[2] Casement, *Japan's Technology: Tomorrow's Leaders -- A Survey*, The Economist, June 19, 1982, at 58.

[3] N.Y. Times, May 18, 1983 at D26, col. 2.

[4] *The Next Generation of Chips Is on Its Way*, The Economist, Dec. 13, 1980, at 71.

[5] N.Y. Times, July 27, 1982, at A1, col. 1, D13, col. 1; Wall Street Journal, May 11, 1983, at 39, col. 2.

[6] *Aid by Japan on Computers*, N.Y. Times, April 15, 1982, at D7, col. 7.

[7] Sherman Act, § 1, 15 U.S.C. §§ 1,2 (1976 & Supp. IV. 1980); *see* Chicago Bd. of Trade v. United States, 246 U.S. 231, 238 (1918); Standard Oil Co. v. United States, 221 U.S. 1, 59-60 (1911).

[8] J. Schumpeter, *Capitalism, Socialism and Democracy* (3d ed. 1950) at p. 84.

[9] Am. Tobacco Co. v. United States, 328 U.S. 781, 786 (1946).

[10] United States v. Grinnell Corp., 384 U.S. 563, 570-71 (1966). It has similarly been recently held by the Court of Appeals for the Second Circuit that the acquisition of patents covering inventions which were later successfully developed, leading to monopoly power, was lawful. The Court recognized not only the importance of inventors in the innovation process, but also the "key role" of investors in "both the funding of research that leads to inventions and the promotion that necessarily must follow to achieve successful commercialization . . . ." SCM Corp. v. Xerox Corp., 645 F.2d 1195, 1206 n.9 (2d Cir. 1981), *cert. denied*, 102 S. Ct. 1708 (1982).

11 15 U.S.C. § 1.

12 Nat'l Soc'y of Professional Eng'rs v. United States, 435 U.S. 679, 691 (1978). One is to consider, in the words of Justice Brandeis:

> "the facts peculiar to the business to which the restraint is applied; its condition before and after the restraint was imposed; the nature of the restraint and its effect, actual or probable. The history of the restraint, the evil believed to exist, the reason for adopting the particular remedy, the purpose or end sought to be attained, are all relevant facts." Chicago Bd. of Trade v. United States, 246 U.S. 231, 238 (1918).

13 Berkey Photo, Inc. v. Eastman Kodak Co., 603 F.2d 263, 302 (2d Cir. 1979), cert. denied, 100 S. Ct. 1061 (1980). These factors were listed with reference to a joint research venture engaged in by a monopolist but would presumably be relevant to such a venture engaged in by a non-monopolist.

14 SCM Corp. v. Xerox Corp., 463 F. Supp. 983 (D. Conn. 1978), 645 F.2d 1195 (2d Cir. 1981), cert. denied, 455 U.S. 1016 (1982).

15 The FTC also filed a suit against Xerox in 1973, FTC v. Xerox Corp., Docket No. 8909, which was settled by a consent judgment which, among other things, provided that Xerox would license many of its patents (July 29, 1975).

16 Supra note 13.

17 603 F.2d at 303. The Court was not happy with this charge, however, and said that a preferable charge would require that

> "the restraints . . . not exceed 'the limits reasonably necessary to meet the competitive problems.'" Id. at 304.

18 Id. at 304.

19 100 S. Ct. 1061 (1980).

20 Id. at 1061, 1062.

21 Id. at 1062.

[22] *President's Message*, 15 Weekly Comp. Pres. Doc. 2069 (Oct. 31, 1979) at 2070.

[23] *Id*. at 2070-71.

[24] *Antitrust Guide Concerning Research Joint Ventures*, [July-Dec.] Antitrust & Trade Reg. Rep. (BNA) No. 99 (Dec. 4, 1980) (Special Supplement).

[25] *Id*. at 3-7.

[26] *Id*. at 2.

[27] Antitrust Division Business Review Procedure, 28 C.F.R. § 50.6 (1981).

[28] *Id*.

[29] 16 C.F.R. §§ 1.1-1.4 (1981).

[30] 645 F.2d at 1208.

[31] See Article 85, Treaty of Rome (1958). The Patent System provides an instructive analogy. In order to promote innovation it provides exclusive rights which are accorded priority in antitrust cases. Walker Process Equipment, Inc. v. Food Mach. & Chem. Corp., 382 U.S. 172, 177 (1965) (a valid patent monopoly confers an "exemption from the antitrust laws"); Dawson Chem. Co. v. Rohm & Haas Co., 448 U.S. 176, 221 (1980) ("[T]he policy of stimulating invention that underlies the entire patent system runs no less deep [than the policy of free competition]"). In any event, two Supreme Court cases have suggested that considerations other than competitive ones, such as marketing efficiencies, will be considered as "redeeming virtues" under the Rule of Reason. In Broadcast Music, Inc. v. CBS, 441 U.S. 1 (1979), the court addressed factors which were not simply competitive in nature, such as the right of copyright owners to effectively exploit their lawful monopolies and the efficiencies achieved in the package licensing of millions of compositions. In Continental T.V., Inc. v. GTE Sylvania, Inc., 433 U.S. 36, 48 n.14, 54-55, the Court cited, among "redeeming virtues," to be considered in assessing a vertical marketing restriction, increased marketing efficiency, protection of consumers against injury, and protection of sellers against product liability claims.

[32] 15 U.S.C. §§ 1801-1804 (1976). *See*, *e.g*., Newspaper Guild v. Levi, 539 F.2d 755, 760 (D.C. Cir. 1976) (The Act was "clearly designed to create an exemption to the antitrust laws."), *cert*. *denied*, 429 U.S. 1092 (2-22-77);

Sun Communications, Inc. v. Waters Publ., Inc., 466 F. Supp. 387 (W.D. Mo. 1979) (The Act "provides exemption only for joint newspaper operating arrangements . . . entered into with the prior approval of the Attorney General . . . ."); Bay Guardian Co. v. Chronicle Publ. Co., 344 F. Supp. 1155, 1160 (N.D.G.L. 1972) (joint operating agreements between newspapers are "insulated against state as well as federal antitrust proceedings"). For the purposes of the Act, the antitrust laws include the Sherman Act, 15 U.S.C. §§ 1-7 (1976 & Supp. IV 1980), the Wilson Tariff Act, 15 U.S.C. §§ 8-11 (1976), the Clayton Act, 15 U.S.C. §§ 12-27 (1976 & Supp. IV 1980), and the Federal Trade Commission Act, 15 U.S.C. §§ 41-46, 47-58 (1976 & Supp. IV 1980), as well as all amendments to these acts and all other laws in pari materia. 15 U.S.C. § 1802(1) (1976). In addition, one court has stated that joint operating arrangements are insulated from state laws to the extent that the state laws are contrary to the Congressional purpose of allowing such arrangements. Bay Guardian Co. v. Chronicle Publishing Co., 344 F. Supp. 1155, 1160 (N.D. Cal. 1972).

Only those newspapers which publish one or more issues weekly and which devote a substantial portion of the publication to news and editorial opinion may utilize the Act. 15 U.S.C. § 1802(2). Given the narrow scope of this Act, it is not surprising that newspapers have applied for an exemption in only a few instances. See generally Wall St. J., June 28, 1982, at 12 col. 1; 5 Trade Reg. Rep. (CCH) ¶ 50,409, at 55,911-12.

33 15 U.S.C. §§ 1083(b) (1976). Section 1803(b) provides that "[i]t shall be unlawful . . . to enter into, perform or enforce a joint operating arrangement, not already in effect, except with the prior written consent of the Attorney General." If interpreted literally, the statute requires that all joint newspaper arrangements entered into after July 24, 1970 must obtain the Attorney General's consent before they may be put into effect. Newspaper Guild v. Levi, 539 F.2d 755, 757 (D.C. Cir. 1976), cert. denied, 429 U.S. 1092 (1977). One court has concluded, however, that the legislative history of the statute reveals that Congress intended to provide a limited exemption to the antitrust laws and not add a substantive rule of law requiring all joint newspaper arrangements entered into after July, 1970, to obtain the Attorney General's prior approval. Id. at 757-61.

Another area in which the Justice Department undertakes preliminary review of proposed combinations involves the prenotification and waiting period requirements of Section 7A of the Clayton Act, 15 U.S.C. § 18a (1976 & Supp.

IV 1980) (as added by the Hart-Scott-Rodino Antitrust Improvement Act of 1976, Title II, § 201, Pub. L. 94-435, 90 Stat. 1390). Under that statute, subject to specified exceptions, mergers must be reported to both the Federal Trade Commission and the Justice Department and must be delayed for designated periods. *Id.* § 18a(a). The FTC is empowered to promulgate rules which require notification to "be in such form and contain such documentary material and information relevant to a proposed acquisition as is necessary and appropriate to enable" both agencies to determine if the acquisition would violate the antitrust laws. *Id.* § 18a(d)(1). Both agencies may require the submission of additional relevant information. *Id.* (e)(I). Generally, the waiting period is 30 days but may be extended for a period of 20 days. *Id.* § 18a(b)(1), (e)(2). In the case of a cash tender offer, the waiting period is 15 days, subject to a 10 day extension. *Id.* The Act also created special procedures for agency actions for preliminary injunctions, *see id.* § 18a(f), but even if either agency failed to challenge the proposed acquisition during the waiting period, normal antitrust proceedings may still be brought. *Id.* § 18a(i).

Mr. WALGREN. Thank you very much, Mr. Sobel.

We will proceed with Mr. Stein.

STATEMENT OF ALVIN M. STEIN, PARKER, CHAPIN, FLATTAU & KLIMPL

Mr. STEIN. My name is Alvin M. Stein. I am a senior litigator in the New York firm of Parker, Chapin, Flattau & Klimpl. As indicated, I was the attorney for the Berkey Co. in that lawsuit. However, I have represented defendents as well in the antitrust area and I do not believe that my participation as plaintiff's counsel in the *Berkey* case reflects any particularly bias on my part with regard to this legislation.

I still have the reservation that this perceived concern that industry is said to have about the antitrust laws and their effect on joint venture undertakings may be more of an excuse than an explanation. Certainly, as everyone indicated there is very, very little to suggest that the antitrust fields are a real concern to a bona fide joint research effort.

Mr. Sobel mentioned the *Berkey* case and the decision in that case involving the research joint venture I suppose between the lamp company Sylvania and Kodak where the plaintiff did come out of the trial court with a jury verdict which was sustained on appeal.

However, it was important to note that in that case what was attacked was not the joint research but the ancillary restraints which flowed from that and those restraints where the agreement between Kodak, who he submitted made little contribution to that joint research effort, and Sylvania preventing Sylvania from making disclosure to other camera manufacturers, in this case Berkey the only other domestic manufacturer of cameras.

And that is precisely this sort of thing that concerns me about what we are dealing with here.

Not only would the legislation we are talking about here apparently sanction joint ventures which may be a mixed blessing. I mean even what we have heard today suggests some doubts and reservations about the proprietary and competitive effect of joint ventures. Someone suggests a joint venture should include everyone in an industry and others say, Mr. Baxter I think said if there were four firms in a five-firm industry that would be bad.

So what I am saying is that even dealing with that basic concept one could quarrel as to whether a particular joint venture would, in fact, be procompetitive. It requires some very sophisticated thinking and evaluation. But even beyond that my great fear is that the legislation we are talking about here sanctions not only what appears to be good but what also may necessarily be bad and that is the collateral restraints, restraints against other research, restraints of a territorial nature.

Restraints of a product nature. Exchange of information regarding product introduction, the withholding of products from market, pricing and price information.

As I read the legislation, it may very well be that the immunity we are talking about extends to all of these collateral restraints and may be perpetual in nature. Mr. Sobel is absolutely right that the effect of this joint research may be incapable of real evaluation at the outset. You may have to look at it 5, 10, 15, 25 years later and I really question whether the Justice Department or anyone else can have the prescience to determine at the outset of a venture like this what kind of anticompetitive effects it may have later on. And yet, the immunity which would be given at the outset would extend into time.

Therefore, my principal objection to this legislation and the changes we are talking about, and I think they all suffer from the same defect, is that it provides for this broad immunity and it does it without meaningful participation by public members, competitors or potential competitors. And by potential competitors, I mean that even if competitors or potential competitors come along 5 or 10 years later after the certification or immunity has been conferred they would have no opportunity to attack the certification.

I would like to address another subject which has come up and that is this business about treble damages and the anxiety to eliminate treble damages. Let me say that the Supreme Court has recognized and enunicated the real purpose for treble damages. It is not just to make a defendant pay more than compensatory damages. It is rather to permit private antitrust litigation to go forward. If you start with the assumption or recognition, and I speak now of the recognition of the Supreme Court that private enforcement of the antitrust laws has a salutary effect then you must recognize the impediments to private antitrust enforcement.

It is very, very complex. It is very, very costly litigation. Merely permitting an injured plaintiff to recover compensatory damages would not leave that plaintiff whole because of the expenses and costs of a litigation. Treble damages was designed in a rough way to make that litigation possible. To eliminate treble damages would further discourage private antitrust enforcement. It is interesting that the suggestion is that treble damages perhaps be allowed in per se cases but not in rule of reason cases which, on the analysis I have just mentioned, is totally illogical because the per se cases are the easy cases, the quick cases, the cases that do not involve an enormity of effort.

It is the rule of reason case that requires all of this effort and if the plaintiff is successful then he should be rewarded in terms of treble damages.

But, the bottom line of all of this is that private antitrust litigation is not, in practical terms, a real threat. In the sense that it is complex, costly litigation, no one can take it on or effectively prosecute it unless they are willing to make a deep commitment to the case. Unless a plaintiff has a very good case and has a lot of dollars, I don't believe there is any real threat to private antitrust litigation. And the record of litigation indicates or confirms what I am saying. That being the core present attitudes, the cost of litigation have tended to discourage private antitrust litigation.

I have included some statistics in my written presentation which indicate that in the year 1980 there were 1,400 private antitrust actions instituted.

In 1982, that figure had declined to 1,037. And I would suspect that much of that private litigation is in the area of hard core price fixing where actions were started after the Government had proven an antitrust price fixing case in the criminal context or that this litigation grew out of contested mergers.

What I am really saying is that private antitrust litigation for all of the reasons I mentioned is not a real threat and I believe we are overreacting to the perception which industry says it has and I think the overreaction will so injure the antitrust laws and sanction so much other anticompetitive conduct as to clearly outweigh the advantages of its assuaging this perceived concern. Thank you.

[The prepared statement of Mr. Stein follows:]

STATEMENT OF ALVIN M. STEIN* BEFORE THE SUBCOMMITTEES ON INVESTIGATIONS AND OVERSIGHT AND SCIENCE, RESEARCH AND TECHNOLOGY OF THE HOUSE OF REPRESENTATIVES COMMITTEE ON SCIENCE AND TECHNOLOGY

I appreciate this opportunity afforded to me, as a member of the New York Bar for more than thirty-five years, to express my personal views regarding the proposed legislation to modify the federal antitrust laws with respect to research joint ventures. Based upon my experience in the trials of antitrust cases, as well as counseling clients in varied industries regarding compliance with the antitrust laws, I believe there is a serious question as to whether the need for such new legislation exists, and as to whether the deterrent to antitrust enforcement, which this legislation provides, outweighs the perceived advantages.

The major stated purpose of the proposed legislation is the perceived concern of United States companies that their participation in research joint ventures may expose them to attack under the antitrust laws. I submit that such fears are misplaced and have not been engendered by any actual developments in more than seventy-five years of antitrust history.**

As recently noted in the Justice Department's Antitrust Guide Concerning Research Joint Ventures (1980) (hereinafter referred to as the "Guide"): "A pure research joint venture without ancillary restraints has never been challenged by the

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** While current literature may suggest a widespread hesitancy to undertake joint research due to fears of the antitrust laws, I question whether this is, in fact, the general perception in our business community and whether such perception has actually inhibited joint research. The antitrust laws have, however, consistently been applied to prohibit anticompetitive agreements among competitors which, under the guise of or in connection with joint research projects, served to inhibit technological progress and competition. See, e.g., United States v. General Electric Co., 82 F. Supp. 753 (D.N.J. 1949).

Antitrust Division. Even cases challenging restrictive conditions in such ventures have been rare." Id. at p. 2. The Guide itself was drafted to respond to apprehensions concerning application of the law to research joint ventures, and certainly this document has gone far to clarify that joint research may be engaged in without violating the antitrust laws. Id. at p. 2. The Guide did not modify or reinterpret the existing law, but sought to clarify the concept of a legitimate research joint venture under antitrust analysis.*

The Guide also discusses those agreements or restraints commonly found ancillary to joint research venture agreements which have historically been found unlawful and which may accordingly be likely to subject businesses to antitrust scrutiny. Examples of such agreements contained in the Guide include pooling of confidential information, such as product introduction dates, and restrictions on independent development, production and marketing of the inventions resulting from the research.

It has frequently been noted that research joint ventures may lead to anticompetitive risks similar to those found in any joint venture arrangement. See Brodley, Joint Ventures and Antitrust Policy, 95 Harv. L. Rev. 1521, 1570 et seq. (1982); United States Department of Justice, Antitrust Division "Antitrust Guide for International Operations" (1977) at p. 20. Thus, any joint venture may facilitate exchanges of price information, horizontal territorial allocations, agreements not to engage in independent research, agreements not to deal with competitors of one joint venturer, or agreements to withold the products of research from the market.

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* The Guide has summarized the applicable standards as follows: "The legality of a research joint venture depends on the nature of the proposed research, the joint venturers, the industry and the restraints on conduct imposed in connection with the project. In general, the closer the joint activity is to the basic research end of the research spectrum — i.e., the farther removed it is from substantial market effects and developmental issues — the more likely it is to be acceptable under the antitrust laws. Also, the greater the number of actual and potential competitors in an industry, the more likely that a joint research project will not unreasonably restrain competition. And, the narrower the field of joint activity and the more limited the collateral restraints involved, the greater the chances that the project will not offend the antitrust laws." Id. at 2-3.

In sum, our antitrust laws clearly do not condemn those joint ventures whose sole purpose and function is the furtherance of industrial research and development. No case has ever held to the contrary. What our laws do prohibit, however, are those agreements or ventures which, instead of furthering competition and progress in the marketplace, seek to obtain for a small number of firms unjustified competitive advantages which are not the pure products of technological improvements. See, e.g., Berkey v. Eastman Kodak Co., 603 F.2d 263, cert. denied, 444 U.S. 1093 (1980).*

I submit that the basic teachings and underpinnings of the antitrust laws still remain valid in that agreements which are anticompetitive in nature, or that monopolies which are illegally obtained or maintained, are not in the public interest. Accordingly, we ought not inhibit or place additional obstacles in the way of antitrust enforcement unless we are prepared to abandon the philosophy behind the antitrust laws.

As will be discussed more fully below, the proposed amendments to the statutes which are under consideration by the Subcommittees today do appear to place new obstacles in the way of antitrust enforcement, in the absence of any real showing of need.

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*United States v. Automobile Mfrs. Assn., Inc., 1969 Trade Cas. ¶72,907 (D.C. Cal. 1969) is a case often referred to in discussions relating to the impact of the antitrust laws on joint research and development projects. The persuasiveness and significance of that case, however, is questionable. There the complaint alleged an anti-public interest industry-wide conspiracy to delay and obstruct the development of pollution control devices for motor vehicles. Although the defendants in that action entered into a consent decree, that decree has recently been modified. See 1982-83 Trade Cas. ¶65,175 (C.D. Cal 1982).

It is questionable whether the arrangements contemplated by these proposals would, in fact, be procompetitive, i.e., the smaller firms in a given industry, which would not normally be dissuaded from participating in a research joint venture by antitrust concerns, might not benefit at all from the proposed amendments.

We also question whether there exists sufficient empirical proof of need for legislation of this nature, and what effect such piecemeal exceptions to antitrust law will have on necessary antitrust enforcement.

My thoughts and brief comments regarding the specific legislative proposals forwarded to me by the subcommittees are set forth hereinbelow.

1. H.R. 108; S. 1383

H.R. 108 and S.1383 both provide for the issuance of a "Certificate of Review" by the Attorney General with respect to qualifying joint research ventures. The certificate would, prospectively, either limit or eliminate entirely liability for any conduct undertaken by the joint venturers which might otherwise constitute a violation of antitrust law so long as the "violation arises from conduct specified in the certificate and if the certificate is in effect at the time the conduct occurs." (See ¶9[b] [i] of each proposal).

Thus these provisions are so imperfectly drawn as perhaps to sanction not only conduct and agreements found to be an integral part of the venture (regardless of their procompetitive or anticompetitive nature), but also any ancillary agreements which "arise out of" the venture. It could conceivably be argued under the language of these provisions that an agreement to withold the product of the research from the market for two years until one or both of the joint venturers would be best able to utilize it would be protected, and yet would unquestionably result in the lessening of competition.

Moreover, under each of these provisions, no opportunity is afforded for any competitor, customer or supplier of any potential joint venturer, or any other private party, to be heard to oppose any grant of certification. While the proposed certificates would not necessarily expire of their own accord, no avenue is offered for a private party to ever challenge certification. Furthermore, competitors would have no right to participate in any joint venture certified pursuant to this statute, or to obtain licenses for use of the product of the research within any given time period.

Finally, the definition of "research and development program" provided in paragraphs 14(4) of each provision may be ambiguous and therefore inadvertently create a loophole which might materially undercut the proposal. Pursuant to the definition set forth therein, corporations would be permitted to jointly establish a "corporation to exploit patents" —a concept reaching far beyond mere licensing and collection of royalties -and still qualify for immunity from the antitrust laws as participants in "research and development programs."

2. S. 568

Like H. 108 and S. 1383, S. 568 provides for prospective immunity from the antitrust laws which extends to any conduct undertaken pursuant to an approved joint venture. While this bill would require the Attorney General to undertake an extensive analysis of the competitive impact of a venture seeking certification (see ¶5[d]), it nonetheless fails to afford any private party an opportunity to challenge such certification. Since the certification may be perpetual and the immunity to antitrust scrutiny granted thereby is absolute, competitors may be forever foreclosed from asserting any legal objection or recovering damages for any otherwise unlawful conduct engaged in by the joint venturers which is ancillary to their joint research project.*

3. H.R. 1952; S. 737

H.R. 1952 and S. 737 appear to promulgate criteria for a defense to be made available to research joint venturers. While no prior certification or immunity is provided, a party (which has made the appropriate filing) whose joint venture is challenged could presumably raise the standards enumerated in the statute as a shield to an antitrust complaint.

First of all, any pure research and development joint venture which was able to demonstrate compliance with the detailed and exacting provisions of this statute would also therefore not have violated any existing antitrust law with respect to the narrow pursuit of the venture. Thus, instead of materially changing the current standards, this statute provides a complex series of factual issues to be tried, the burden of which would be most likely to fall on defendants.

On the other hand, however, pararaph 6 of this statute would grant absolute antitrust immunity for the venture as well as its employees, regardless of how flagrant a violation they might commit, so long as the venture itself qualifies under the statute and the appropriate filing has been made. (For example, the statute would not prohibit joint venturers from entering into exclusive reciprocal dealing agreements in some way related to the work of the joint venture.) It appears that pursuant to this statute companies could exchange sensitive information — such as marketing and pricing data — so long as the information is "pertinent" to the subject of the research, and might jointly establish a corporation "to exploit patents", all without any risk of liability. See paragraph 3(2).

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* While this proposal would require participation in the venture to be available to any United States firm, for a small firm, or one that has recently entered the market, the cost of bearing a *pro rata* share of the expenses of the project may be prohibitive.

Furthermore, this provision would define "United States firms" as firms "controlled by United States firms or citizens, but shall also include entities controlled by a foreign firm or citizen if that nation provides access to participation in joint research and development efforts to United States firms..." Unfortunately the concept of "control" of a United States corporation is far from unambiguous. Thus, caselaw has held, for example, that ownership of 28.3% of the stock of a corporation may, under appropriate circumstances, constitute a controlling interest in the corporation. *See, e.g.*, *Essex Universal Corp.* v. *Yates*, 305 F. 2d 572 (2d. Cir. 1962). As found by the Court in *Essex*, the issue of "control" of a corporation may well be a question of fact best determined upon a trial.

Like other proposals under consideration here, this statute would require competitors or other outside firms desiring to participate in the venture to pay a proportional share of the venture's common expenses. As set forth hereinabove the equity of this provision may be illusory, since a new arrival in a market will not be able to participate in a joint venture to the same extent as a Fortune 500 Company.

4. Reagan Administration's Legislative Proposals On Antitrust, Patents, Copyrights, and Trademarks, Approved By the Cabinet on March 24, 1983

a. Part I of the Administration's proposal, captioned "Antitrust Damage Recoveries" would all but eliminate the treble damage awards available to private plaintiffs under section 4 of the Clayton Act.* In light of the limitations on the resources of government to monitor anticompetitive conduct, as well as the magnitude of the undertaking required of a private plaintiff in antitrust litigation, this provision would clearly stifle private enforcement and therefore undermine the well established goals of the Sherman and Clayton Acts.

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* The proposal would retain treble damage awards only for "practices the nature or necessary effect of which is so plainly anticompetitive that they are deemed unreasonable and therefore illegal without elaborate study in each individual case as to the precise harm they have caused or the business justification for their use". For purposes of this discussion we will assume this ambiguously stated exception is limited to what caselaw has defined as the "*per se*" case, involving those practices, such as price fixing, which will constitute a violation of law regardless of any possible business or economic justification, the impact of the practice on the marketplace or the possible reasonableness of the practice. *See* *United States* v. *Sealy, Inc.*, 388 U.S. 350 (1967). In the absence of the standards enumerated in the case law with respect to *per se* violations, the language contained in this provision might well prove unworkable.

By the very nature of the issues involved, antitrust litigation is necessarily complex, difficult and costly for private litigants to undertake. Private enforcement of the antitrust laws has traditionally been regarded as salutary and in the public interest, and by offering potential litigants the prospect of a recovery in three times the amount of their damages, Congress encouraged these persons to serve as "private attorneys general." Hawaii v. Standard Oil Co., 405 U.S. 251, 262 (1972). Thus the purpose of giving private parties treble damages was not merely to provide private relief, but to serve as well the purpose of enforcing the antitrust laws. See, e.g., Zenith Radio Corp. v. Hazletine Research, Inc., 395 U.S. 100, 130-31 (1969); United States v. Borden Co., 347 U.S. 514 (1954).

Without the potential for treble damage recoveries, private enforcement of antitrust law will not simply be discouraged, but may well become extinct.

In fact, even under current laws, the number of private parties willing to undertake this burden has decreased as the result of the overwhelming cost and duration of most antitrust litigation. Thus, the 1982 Annual Report of the Director of the Administrative Office of the United States Courts reveals that while the total number of private federal lawsuits filed since 1980 has increased, the number of antitrust actions has decreased as follows:

Year	Number of Private Antitrust Cases Commenced
1980	1,457
1981	1,292
1982	1,037

This steady decline of interest in the filing of private suits seeking treble damages makes clear the inevitable negation of private antitrust enforcement in the event that potential recoveries become increasingly limited.

As stated by Justice Marshall in Hawaii v. Standard Oil Co. supra, "Every violation of the antitrust laws is a blow to the free enterprise system envisaged by Congress." Id. at 262. To the extent this proposal intends to do away with treble damages, except in the unusual case, it would fly in the face of the earlier thinking.

b. Part II of the Administration's proposal, captioned "Amendment of the Clayton Act", provides that "Agreements to engage in joint research and development...shall not be deemed unlawful per se in actions under the antitrust laws." This is, in fact, precisely in accord with current law.

Since the Supreme Court of the United States rendered its decision in United States v. Penn-Olin Chemical Co., 378 U.S. 158 (1964) it has been perfectly clear that joint ventures are subject to a "rule of reason" analysis under antitrust law -- in fact, by standards even less stringent than those commonly applied to mergers and acquisitions.

Accordingly, the only real impact of this amendment would result from the operation of this provision in conjunction with the proposed elimination of treble damage awards in all but per se cases — thus making it clear that no private plaintiff could recover treble damages in any action challenging the legality of such a joint venture agreement. To the extent a private plaintiff might now commence an action seeking treble damages in connection with a pure research joint venture agreement, his chances of recovery under current law would be remote, and this provision would not affect that result. If, however, the agreement challenged was, in fact, an exclusive reciprocal dealing agreement ancillary to a research joint venture, the operation of these two provisions might well prevent that plaintiff from obtaining a treble damage award and thereby discourage institution of the litigation entirely.

Mr. Walgren. Thank you very much, Mr. Stein. That was a good statement.

Mr. Ginsburg.

STATEMENT OF DOUGLAS H. GINSBURG, PROFESSOR OF LAW, HARVARD LAW SCHOOL

Mr. Ginsburg. Thank you, Mr. Chairman.

I have given you a copy of my statement and I will just touch on a few of the points made in it. First, let me say that the opening remarks by Congressman Zschau this morning were to the effect that perhaps some of the bills that have been introduced did not allow enough flexibility and I wanted to return to that point for just a moment. There is no formula by which a statute could describe a joint research venture that should be granted any kind of special treatment under the antitrust laws simply because there are too many dimensions and factors that would have to go into determination that a particular antitrust venture would promote innovation and competition rather than provide a vehicle for inhibiting competition among the parties.

Those factors are such things as the degree to which basic rather than applied research is involved. The share of the relevant markets that the firms involved represent and the reasons that they have advanced in support of their joint effort rather than proceeding through independent research to compete in the race toward their objective.

That being the case, it is inevitable that there will be a fair amount of discretion required by whomever is assigned the task of evaluating these research proposals whether it is the Department of Justice or ultimately a reviewing court. That is unavoidable and I think that people who have just spoken would agree that the complexity of each of these cases will defy formula treatment.

That leaves us with the question of who is going to make this evaluation, what procedures are going to be followed, who will have rights to object. And that is the set of questions that have occupied a lot of attention this morning and this afternoon.

I would suggest that the present procedures under which the Department of Justice reviews a business proposal and announces its present intention with respect to enforcement or nonenforcement, whether it believes the proposed activity would violate the antitrust laws is deficient precisely because it is incapable of assuring the proponents of the proposal that they will be secure from the type of private litigation that Mr. Stein has just been describing as little threat.

In fact, however, this is the type of litigation one would expect, not at the time necessarily that the joint venture is proposed, but more likely at the time that it is proven to be successful if it is. We can imagine that there will be few people coming forward to object to their exclusion or nonparticipation in a joint venture that does not produce commercializable results. And that there will be many who will come forward later on in order to object under the antitrust laws to having been either excluded or simply denied the benefit of other peoples' research.

The approach represented in most of the bills at hand today would actually give these nonparticipants rights of access either a mandatory right to join the joint venture even after the fact or to license the technology that it produces.

These features of the bills would make the joint venture undertaking that they contemplate significantly less attractive to firms that might otherwise want to proceed on a joint basis.

Essentially, it would tell these would-be collaborators that on payment of a charge to be determined later on another firm may purchase essentially participation in the benefits without having taken any of the risks associated with the undertaking.

I think it would be more advisable for the committees to concern themselves not with mandatory sharing rights and the possibility of industrywide research cartels but rather with stimulating competing centers of joint research. I think that would be a more likely result if the procedure were established whereby firms representing only a modest portion of any particular market were allowed to launch research efforts on a joint basis and to do so with assurances that they would be immune from private litigation either at the time or even more importantly later on when their activity has borne fruit.

One other aspect of the bills that I would like to mention is the suggestion that they be structured along particular regulatory lines such as having a management board with designated participants from different interests with specific obligations that that board would have to discharge and so on.

This is a completely unnecessary intrusion into the decision of the parties to organize their research in whatever way on a joint basis they think is efficient whether it is by the formation of a partnership, the creation of a joint subsidiary, informal collaboration. So long as the substance of their collaboration has gone through a prescreening process and been scrutinized by the Department of Justice or the Federal Trade Commission, I see no continuing interest in assuring that it be structured in some uniform mold that has been preconceived for it.

Thank you.

[The prepared statement of Mr. Ginsburg follows:]

HARVARD LAW SCHOOL
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Statement of

Professor Douglas H. Ginsburg

Harvard Law School

Mr. Chairman and distinguished members of the subcommittees, my name is Douglas H. Ginsburg. I am a Professor of Law at the Harvard Law School, and I appear before you in that individual capacity.

I appreciate your invitation to participate on this panel, focusing on the relationship between the antitrust laws and the ability of U.S. companies to form research joint ventures. Having reviewed the various bills that the staff forwarded to me, I would like to offer a few general observations about the principles that I believe the subcommittees should follow in proposing any legislation to amend the antitrust laws with the purpose of encouraging research joint ventures.

I. There is no useful formula by which a statute could distinguish pro-competitive from anti-competitive joint research ventures.

First, the competitive significance of any particular research joint venture will depend upon a number of factors that will vary from case to case. These include the degree to which the proposed research undertaking is closer to basic than to applied research, the share of any relevant market represented by the proposed participants in the joint venture; and the reasons advanced in support of joint rather than rivalrous research efforts by the specific firms proposing to collaborate.

It is often difficult for a single firm to appropriate the benefits of its own basic research. For this reason, individual firms are less likely to undertake basic research. Instead, universities, other public and private research institutions, and perhaps trade associations, are more likely to undertake basic research. For an industry to do basic research, it may be necessary for a substantial portion of the industry to participate in underwriting the cost. Insofar as a joint research venture is proposing to undertake basic research, therefore, it may be filling a need that no single firm would fill; that need would go unfilled if the antitrust laws operated to prohibit such a joint venture.

At the same time, the greater the share of any given product market represented by the participants in a particular joint venture, the greater is the danger that their collaborative research effort will become the vehicle for anticompetitive collusion in that market.

Finally, if the research in question is not so basic that there would be insufficient incentive for firms to pursue it independently, there must be some other affirmative justification for their collaboration. Otherwise the Attorney General could not conclude that the potential technological gains from collaborative research are likely, in the particular case, to outweigh the potential losses to competition--both technological and other forms of competition--from allowing collaborative research to displace research that is pursued independently.

The complex interplay of these factors requires that the Attorney General be given substantial discretion to evaluate proposed research joint ventures on a case-by-case basis. The Attorney General proceeds in this manner at present, under the Antitrust Division's business review procedure. That procedure is informed to some extent by the Antitrust Guide Concerning Research Joint Ventures, released by the Antitrust Division of the Department of Justice, in November 1980.

II. The procedures for administrative evaluation of proposed joint ventures should remain relatively informal; they should not be subjected to judicial review, even if approval confers immunity from private antitrust actions.

At present, however, the Antitrust Division can only state its enforcement intentions with respect to any proposed joint research venture. It cannot confer an effective immunity from private suit.

Legislation that enabled the Attorney General to grant an effective immunity to the participants in a joint research venture would make good sense. While firms proposing a joint research venture must derive substantial comfort from knowing that the Antitrust Division does not view their collaboration as unlawful, they cannot be unmindful either of the possibility that their efforts will be met with private litigation, with its attendant risks and inevitable costs. These risks and costs may be a substantial deterrent to would-be joint venturers, notwithstanding the Department of Justice's non-enforcement position.

If the Attorney General is empowered to immunize research collaborators from antitrust liability in private litigation, it does not necessarily follow that his decisions should be reviewable in court. If the Attorney General disapproves a proposed research joint venture, the effect is not to prohibit it, but rather to make clear that the Government believes that the joint venture would violate the antitrust laws, and therefore, that it might bring an antitrust action if the parties proceed to combine their efforts. This is a straightforward exercise of prosecutorial discretion, which is almost never subject to judicial review. Likewise, if the Attorney General determines that a proposed collaboration would not violate the antitrust laws, and advises the proponents that the Government would not bring an enforcement action on the facts before it, that determination is not reviewable in court either.

If, in addition, the Attorney General's determination that a proposed collaboration is lawful cuts off the "right" of private parties to challenge it, that is not a sufficient reason to subject the determination to judicial review at the instance of disappointed potential plaintiffs (who will presumably be competitors of the proponents).

On the contrary, private antitrust actions are authorized, as the Supreme Court has often said, to enlist the efforts of "private Attorneys General" in support of the public policy favoring competition, which is expressed in the antitrust laws. If a proposed research joint venture would be pro-competitive rather than anti-competitive, and if subjecting the collaborators to the risks and costs of private litigation would prevent them from going forward, then private rights of action would frustrate the public interest in competition. The risks, costs, and delay inherent in judicial review proceedings could have almost the same effect--chilling the parties' interest in collaborative research--as would a *de novo* antitrust suit. Firms would surely be reluctant to begin their collaboration knowing that a year or two could elapse before a reviewing court might determine the legal status of their efforts.

III. *The parties to a research joint venture should have the maximum possible degree of freedom to structure their undertaking as they see fit.*

The bills pending in the current Congress would impose a variety of constraints on the parties to a research joint venture. Some would require that any firm have a mandatory right of access to participate in other firms' research joint venture, or to obtain a compulsory license to its technology. Some of the bills would require that a "management board" be established, analogous to a corporate board of directors. The management board would have specific legal responsibilities and even a requirement that there be some members unaffiliated with the collaborating firms, in the nature of independent directors in the corporate setting.

These structural requirements would presumably be inapplicable to research joint ventures that did not seek immunity from private antitrust actions. At the same time, these requirements would not advance, but would frustrate the purposes of the antitrust laws. The mandatory right of access and compulsory license are probably anti-competitive. The management board requirements are costly and unnecessary, at least if approved research joint ventures are limited to those which are pro-competitive in the first place.

A mandatory right of access for firm X to participate in the benefits of the collaborative research of firms Y and Z would surely act as a deterrent to the latter firms undertaking such research. Mandatory sharing would enable firm X to avoid the risk associated with the research effort, and yet to participate in the benefits should it succeed. One can be sure that such partners will not come forward to participate in joint ventures that have failed to yield commercially valuable results. I understand that the participating firms would be permitted to charge a "reasonable catchup charge"--which would presumably reflect a risk premium for the risk that they took--when such a fair-weather partner sought to join the joint venture. I think it very doubtful, however, that an appropriate risk premium could be determined and imposed. The actuarial problems would be great, and the result would probably be determined more by the costs of litigation than by any realistic risk calculations.

In addition, mandatory sharing rights will diminish the probability that competing centers of joint research activity will be established in a particular industry. If industry-wide collaboration is not clearly shown to be justified in a particular set of circumstances--involving for example, applied research, that is likely to be appropriable, where there are no apparent economies of scale or complimentarities of resources--then the Attorney General should not approve joint research efforts involving firms that represent a dangerously high percentage of sales in a particular product market. To do so would be to risk collusion in the relevant market without any off-setting reason to think that collaboration would result in the firms pursuing research that they would not pursue independently.

If firms have a mandatory right to participate in a joint venture, however, that is to say that the Attorney General cannot disapprove their participation as an undue risk to competition. Some of the bills attempt to straddle this tension between mandatory sharing and its anti-competitive implication. S.568, for example, would require the Attorney General to approve a research joint venture that met certain conditions, including that it be open to all companies, "unless he finds that any of the joint research and development programs will lessen existing or potential competition between firms to such an extent as to foreclose the existing or potential competitors from participating in such market." (§5(d)(2)) That appears to set a very high standard for disapproval. Indeed, it seems to require the Attorney General to tolerate substantial anti-competitive consequences from industry-wide joint ventures, even if there was not justification for allowing the joint venture to be industry-wide in the first place.

The mandatory sharing aspect of these bills was probably animated by a sense that some firms would be disadvantaged if they did not participate in a research joint venture that succeeded in developing some technology, use of which thereafter became essential for any firm to remain a viable competitor. The same concern appears to underlie the compulsory licensing requirements, under which jointly developed innovations must be licensed to all comers on a non-discriminatory basis after a certain number of years--three or six depending upon the bill. This provision strengthens the incentive provided by the mandatory sharing provisions for a firm not to participate in a research joint venture until it is a proven success. Then the non-participating firm could choose between paying a risk premium to join, or waiting as little as three years to get access to the technology, and can do whichever seems more advantageous at the time. It further diminishes the rewards that those firms that do participate will be allowed to reap for their efforts. And it puts joint research on a disadvantageous footing compared to independent research.

Once one abandons the industry-wide mandatory sharing approach to joint research, however, and instead thinks merely in terms of extending the present law to allow the Attorney General to grant antitrust immunity to joint efforts that are not anti-competitive, it is clear that no compulsory licensing provision is necessary. There will be competing research efforts--perhaps some conducted independently and others by approved collaborative efforts--and no more reason than at present to worry that a particular research effort will enable the firm or firms involved to monopolize a market. A joint venture might, of course, yield a breakthrough patent that gives the participants a substantial marketplace advantage, but so too might independent research. So long as the Attorney General has found that the joint venture is not anti-competitive, there is no reason to treat the results of its effort any differently than the results of independent research efforts.

Mr. **Walgren**. Thank you very much.

Well, I think at this point I just ought to express my real appreciation for the time and the attention that you have given to this subject. You are an extremely distinguished panel. I hope that there will be some cross fertilization among you in the time that you have had to spend here together. Certainly the record will be largely enhanced by your contributions and I think there is going to be some legislative discussion in this area.

If I made a guess, the points that you have made will be presented with greater clarity than some of the other longer discussions so I want to say how much I appreciate the way you have presented your thoughts.

One other thing, I want to make part of the record a briefing memorandum that was the foundation of these hearings and we will include that in the record.

[The information is contained in appendix II.]

Mr. **Walgren**. Thank you.

[Whereupon, at 1:15 p.m., the subcommittees were adjourned.]

APPENDIX I

WITNESS RESPONSES TO ADDITIONAL QUESTIONS

Questions for Harvey Brooks

1. You noted in your statement that the U.S. still leads the world in the creation of new ideas but not necessarily in bringing them to market? What would it take to gain preeminence at the commercialization end of the spectrum? What lessons can we learn from the Japanese in successfully bringing products to the market?

2. What are some of the production techniques that have contributed to Japan's success? Would you agree with Mr. Arai as to the relationship between workforce management and technological success?

3. Are we now at a point where creative imitation will benefit us technologically? Might such an approach deal a severe blow to our self-image as technological leaders?

4. You note the paradox of Japanese firms at the same time being more cooperative and yet more competitive than U.S. firms. Does the element of competition begin during or after the R&D phase and is competition among Japanese firms as vigorous in Japan as it is internationally?

5. We are impressed with your reference to the manufacturing floor and the office and the need to treat each as an advanced learning classroom. What can we do in the U.S. to encourage continued learning on the job and to bring skilled engineers and technicians closer to the manufacturing process? Do our schools and universities have a role to play in extolling the virtues of continued technological involvement by experienced professionals?

6. It is my impression, that the Japanese consider support to the educational system as a productive investment, i.e., investment in human capital. If this is so, what role does it play in their success and what does it imply for U.S. efforts to compete with Japanese?

Harvey Brooks

Answers to Questions

1. I am not sure I can give a good answer to this question. Probably a major factor is the degree of risk involved in commercializing an innovation after its technical feasibility is established by R. & D. Certainly the cost of capital associated with production and initial marketing is a major component of this risk. A recent report by Hatsopoulos at M.I.T. suggests that the difference in real cost of capital between the U. S. and Japan is much larger than was previously thought, possibly in the ratio of four or five to one. There is no question that the difference is at least two to one. There are many factors involved here, and I cannot pose as an expert. Several might be mentioned--a much higher personal savings rate in Japan, a much higher percentage of credit going into housing and consumer durables in the U. S. as compared with Japan, differences in the tax code that favor investment in production equipment in Japan, greater emphasis on production and applications engineering in Japan as compared with the U. S., greater flexibility and learning of the labor force in Japan in assimilating innovations into the firm's organization. These points are admittedly impressionistic and need closer study.

2. I agree very strongly with Arai's observations regarding workforce management. The important consideration is that the workers should see themselves as sharing in the economic benefits of technological success, something that is much easier to establish in a growth situation, where improvements in productivity do not lead to lay-offs but make possible distribution of productivity gains as higher wages and benefits. Where certain industries enjoy higher productivity growth rates than the average for the economy there

exists a real surplus to distribute, and the connection between innovation, productivity, and real returns to labor are easy to demonstrate. Thus success feeds on success and facilitates more efficient workforce management. But the success of this strategy improves with flexibility in work assignments and division of labor. Where labor practices result in *de facto* rights to particular job functions in an organization, productivity suffers, there is less surplus to share with workers, and it is harder to get the cooperation of workers in changing technology because they cannot see what's in it for them.

3. Yes, I think we are at such a point, and I think it will temporarily hurt our self-image. But in the long run technological advance is not a zero-sum game. We can benefit from the technological leadership of others in certain technological niches. Imitation is cheaper than original invention, and innovation consists as much of novel syntheses of existing knowledge and experience as it does in the creation of new building-block ideas. New ideas from others can help to stimulate our own creativity, and technological self-sufficiency is an expensive luxury that we can no longer afford to indulge.

4. I am not really that expert on Japan, but my impression is that domestic competition is as fierce as competition with foreign firms. I don't believe one can make a rigid separation between the R. and D. phase and the commercialization phase. They are not strictly sequential, but are heavily overlapping. Especially in high technology industry R. and D. never really

stops but simply gradually shifts to the next generation product or process. Competition tends to intensify as each technology gets closer to the market. The more technology embodies specific art or "know-how" the more advantageous it is to keep it from competitors. Conversely, the more it depends on general principles and widely applicable knowledge the greater the mutual advantage of sharing knowledge, with competitors building on each other's advances. As I said in my prepared testimony the most efficient blend of cooperation and competition in scientific and technological advance is extremely subtle and tricky. Too much cooperation at a late stage of the innovation can become a conscious or unconscious conspiracy among competitors not to upset the applecart or spoil each other's markets.

5. I believe there was great virtue in the old system, typical of the 19th and early 20th century when every engineer or manager began on the shop floor and acquired hands-on experience over time in all aspects of the business. I believe that both engineering and management may have become overprofessionalized so that functional specialists in the firm are too remote from the nuts-and-bolts problems of the production line or the consumer. Education can certainly help in alleviating this problem, but I think the management culture of the firm itself is more important. Small firms cannot afford the high degree of functional specialization that is deemed necessary in large firms, and this is often an advantage, especially when quick response to a rapidly changing competitive and technological environment is necessary. The development of a multiplicity of non-communicating "cultures" within a firm is a constant threat to its ability to respond to its environment.

Making it easy for groups of engineers, managers, and skilled technicians to split off from large or growing firms and form small firms to cultivate newly emerging technology or product "niches" is one of the greatest potential sources of strength for U. S. competitiveness. It makes both the small firms and the large firms more competitive. I do believe it would be helpful if students in both engineering and business schools learned more about the "microdynamics" of the economy and not just about macroeconomics, cost-benefit analysis, or investment analysis. The results of recent research in the microdynamics of firms needs to be incorporated into teaching more rapidly.

6. It is not obvious to me that the Japanese do better in supporting their higher eduction system than the U. S. or that Japanese industry is more supportive of education than U. S. industry. If anything, the Japanese may rely too much on in-house training of their engineers and scientists, and this may prove to be a source of weakness as Japanese industry becomes more dependent on working at the frontiers of technology. The lifetime employment system, which goes hand-in-hand with emphasis on in-house training, has both advantages and disadvantages and may have been more beneficial during the past catch-up phase of Japanese economic development than it will be in the future frontier phase. Of course, this is only an opinion. I am not aware of any evidence or studies bearing on this issue.

I would like to conclude this response with some comment on an issue raised by Mr. McKay near the close of the panel. The hearing was terminated before there was an opportunity for me to respond. Mr. McKay questioned whether academic research in the 1960's had not hurt the quality of university teaching. The alleged conflict between research and teaching in the university is an issue whose discussion long predates government support of academic research. My own observation is that the most creative and productive researchers, at least in the natural sciences, are usually the most innovative and conscientious teachers and frequently the most popular with students. Of course, there are exceptions to this generalization, and these exceptions seem to receive a disproportionate amount of attention. There may be some degree of conflict between graduate and undergraduate teaching, but in my opinion this is more than offset by the important role played by graduate students in support of undergraduate teaching, particularly in the laboratory. A far greater threat to the quality of university teaching may be the slow erosion of the economic position of the teaching profession, primarily as a consequence of the inflation of the 70's. This may be leading to the loss of some of our best potential engineering and science teachers to industry as well as to excessive involvement of many teachers in outside consulting and related activities, motivated by the need to supplement their income rather than by its contribution to their intellectual and professional development. This is something that needs careful monitoring.

International Business Machines Corporation

Office of Vice President

Armonk, New York 10504

August 19, 1983

Mr. Jerome Ostrov
House Annex #1
Room 822
300 New Jersey Avenue SE
Washington, DC 20515

Dear Mr. Ostrov:

In response to letter of August 2, 1983, from Congressmen Doug Walgren and Albert Gore, Jr., I am attaching the answers to their questions.

I appreciated the opportunity to testify in front of the Subcommittees on Science, Research and Technology and on Investigations and Oversight on a subject matter of importance.

Sincerely,

Erich Bloch

EB/fa

Attachment

QUESTIONS FOR ERICH BLOCH

Question 1

What are the advantages of SRC over the MCC concept? Are there reasons why your company, IBM, is a member of one and not the other?

Answer 1

These are two different approaches and the goals of the two organizations are quite different.

SRC is a not-for-profit organization. It currently concerns itself with semiconductor research only. Its objectives go beyond furthering the understanding of semiconductors: at the same time, through this effort SRC aims to train and attract more scientists and engineers to this industry. It also is trying to tap an under-utilized resource, namely the university faculty and the university research capabilities. To achieve its objectives, SRC at this time contracts exclusively its projects with a broad number of universities.

On the other hand, I understand that MCC is a for-profit organization, with its mission in four areas:

A. Software Engineering
B. Packaging
C. New Computer Architecture
D. Computer-Aided Design

Note that semiconductor research is absent from the MCC activities. MCC concerns itself with research, as well as development activities and maybe even limited manufacturing. It is establishing its own facilities to perform these tasks.

IBM decided to be a member of the SRC, since SRC activities augment our own research work and is not duplicative. The reason for IBM not joining MCC is that several of the topics that MCC is undertaking are areas in which IBM has made, and is making, a heavy investment and to rely on or duplicate MCC efforts would not be in our best interests.

Question 2

You noted that most of the US-based R&D spending for semiconductors has been for applied rather than basic research. Has this been mirrored by a similar allocation of research funding in Japan? How has the U.S. movement away from enphasizing basic research affected our competitive standing?

Answer 2

With the exception of NTT, which undertakes significant basic research and makes the results available to their Japanese suppliers, much of the R&D spending in Japan on semiconductors is applied research and development. In that respect, it is similar to what has occurred in the U.S.

Another exception to this general statement about Japan is the VLSI program. This was a one-year program that had a clear basic research objective.

The U.S. movement away from emphasizing basic research has eroded the technology lead which U.S. companies had over their Japanese competitors. The narrowing of this gap has occurred in the basic understanding of phenomena and devices, the processes utilized in our manufacturing facilities and the technical design approaches in this vital area. In fact, in some areas it is clear that Japan is now ahead of the U.S. in basic understanding, which was not the case only a few short years ago.

To overcome this situation, the U.S. Government should take several positive steps, such as continuing the R&D Tax Credit and using a zero base for allowing tax credits for industry-sponsored university research.

Question 3

In your statement, you referred to a pilot program for the process definition and advanced design of a four-megabit memory chip. Has SRC committed itself to the pilot project? If so, how will SRC's member companies and the various SRC grant recipients interact during the pilot phase -- of the project? Who will hold the rights to patentable discoveries?

Answer 3

The pilot program I discussed in my testimony is a concept under discussion, not a firm commitment. As a consequence, anything I will discuss below is subject to change. Assuming agreement to proceed, the project will be divided into two phases:

A. R&D Phase:

A new technical group would be formed. Some of the people would be on loan from individual companies, others would be hired from the marketplace. They would undertake the necessary R&D tasks, in conjunction with qualified universities. The participating SRC member companies would commit themselves to license the output of this R&D program upon satisfactory conclusion of the project and would pay for the cost of this project with licensing fees and/or royalties on products manufactured under this license.

B. Pilot Manufacturing Phase:

There will be a pilot manufacturing phase to demonstrate the feasibility of process and design. SRC member companies will then adopt the learning and apply it to their own product development and production of their proprietary advanced memory devices.

There are two approaches being considered for the R&D phase of this project. One, a limited partnership; second, a partnership of several companies. Whichever approach is used, the legal entity will own the rights to patentable discoveries, which will be available for licensing.

Question 4

How do you see SRC coordinating with MCC in developing new technolgies? Is the four-megabit memory chip program a candidate for possible coordination?

Answer 4

We would expect that the four-megabit memory chip program will not be duplicated by the MCC, since, as mentioned before, the MCC activities are outside the semiconductor research or development areas. In addition, several companies which belong to both MCC and SRC will undoubtedly want to avoid duplicative investment.

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CONTROL DATA
CORPORATION

September 23, 1983

Mr. Jerome Ostrov
House Annex #1, Room 822
300 New Jersey Avenue Southeast
Washington, D.C. 20515

Dear Mr. Ostrov:

In response to the letter from Messrs. Walgren and Gore dated August 2, 1983 (attached), I am enclosing the responses requested of me.

Sincerely,

John W. Lacey

John W. Lacey

/ea
Enclosures

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Question 1 - We have heard various characterizations regarding the way in which Japan has promoted various industries. Suffice it to say, there is much room for variation in characterizing so complex a story. Can you tell us how Japan protects its home industries from foreign competition and whether, as some have claimed, such protectionism -- particularly in the electronics field -- is now giving way to more open markets?:

The answer to the last part of your question first, there is, in my opinion, a lot of talk about Japanese protectionism giving way to more open markets but very little evidence, beyond tokenism for public relations benefit, that the fact and the rhetoric coincide.

The literature in recent years has been filled with examples of the methods used by Japan to protect its home markets from foreign competition. Perhaps I can be of most help to the committee by summarizing Control Data's experience in its attempt to establish a time sharing data services business in Japan.

In 1972 we wanted to establish computer services in Japan but at that time the market was restricted, by law, to Japanese companies. We complained vigorously through the U.S. State Department and the Japanese answer was that entry would be allowed very soon - but each year was "next year".

Japan eventually revoked the Buy Japan Cabinet Decree of September 30, 1973, and April 1, 1976 was established as the day after which non-Japanese firms were permitted to operate in Japan without a Japanese partner within the fields of computers and data processing. Despite that, it was not until November 1977, after more than eighteen months of intensive efforts that Control Data was authorized to offer its first two data services in Japan. The processing for these services were to be performed in Cleveland, Ohio, via communication links from Japan.

During that whole period we were subject to constant delays and were forced to comply with arbitrary requirements that caused great inefficiency and cost in those operations. We were forbidden to pass data over the single telecommunications channel other than for the two specific data services products. We were forbidden from sharing telecommunications lines with other elements of Control Data which precluded our ability to provide other data services economically. We were forbidden to perform data switching to other points on our network in the U.S., even though such data switching was then permissible under the "D" Series recommendations of the Consultative Committee for International Telegraph and Telephone of the International Telecommunications Union (CCITT - a suborganization of the United Nations). Japan subscribed to these recommendations under the International Telecommunications Treaty but chose to ignore them, causing us significant delayed market entry and cost.

In order to do business at all, our Japanese branch was obliged to sign a number of Nenshos. The first Nensho, on September 27, 1976, obliged us to consider forming a Japanese subsidiary and to consult with MITI before doing so, to report to MITI any changes in service offerings, price changes and the like, to use Japanese terminals in Japan, to utilize "Japanese electronic computers and equipment related thereto as much as possible considering their suitability, quality, price, delivery, maintenance services, and the like, and to use to the maximum extent possible application programs developed by Japanese enterprises."

A second Nensho on September 30, 1976, obliged us to promise to obey Japanese laws and regulations concerning telecommunications, hold consultations with the Ministry of Post and Telecommunications (MPT), prior to changing any terms and conditions for services including prices, be subject to investigation concerning our Japan Branch office's activities in the gathering of general information regarding the Japanese telecommunication industry and to "fully esteem the administrative guidances made by the Ministry of Posts and Telecommunications with respect to the business activities of the branch office."

On March 18, 1977, we were obliged to grant a Nensho which assured the Ministry of Posts and Telecommunications that we would explain and consult with them before applying for a government validation concerning technologies other than those employed in the two approved data services.

In another Nensho on March 18, 1977, we were required to certify that we understood that:

> "the basic policy of the Japanese government to the effect that the industry of data control and data processing in Japan shall be developed, and such industry shall contribute to the development of the national economy of Japan, to cooperate for such measures as shall be taken by the Japanese government and in line with such basic policy and to engage in prior business activities in Japan relating to

> services offered, equipment utilized or selling methods, to consult with MITI prior to establishing a data center in Japan or making changes in its business activities, to cooperate in investigations in the fields of data control and data processing industry, etc., to consider using Japanese terminals and before and after establishing data centers in Japan, using in the Japan branch "Japanese electronic computers and equipment as much as possible considering their suitability, quality, price, delivery, maintenance services and the like", to foster the softwares and hardware manufactured and developed by the Japanese enterprises which shall be sufficient for the Japan Branch's technical and functional requirements and will contribute to the development of the exportation by Japan and effective utilization of international resources as much as possible by our Japan Branch organization."

On July 17, 1977, we were obliged to grant a Nensho to the Nippon Telegraph and Telephone corporation (NTT), promising that data flow of leased circuit line is limited to run between one input/output device and one computer mainframe and, among other restrictions, "that the computer mainframe is used for data processing and not for message switching."

On August 12, 1977, we were obliged to execute a Nensho promising that, should a substantial modification be made to our software and hardware such modification should be explained to the Ministry to "obtain its understanding." It also required our Japan branch to submit financial statements to MPT after the regular shareholder's meeting and "at the same time the total number of customers shall also be reported to MPT." MPT required further that we respond to the Ministry's "consultation and discussion and follow its administrative guidance."

Our Japan Branch entered into an international specified leased line usage agreement with KDD, the international carrier of Japan. The agreement contained a number of restrictive provisions. Among these were the following:

1. Article 10 required KDD to approve communications equipment to be used and have the continuing right of inspection.

2. Article 11 required our Japan Branch to notify KDD in advance of any additional installation, model change, or moving of communications equipment, and await KDD acknowledgement and inspection before proceeding.

3. The contract period was for one month only.

4. We were obliged to submit once every three months the names and addresses of customers, the reference manuals granted to customers, and any other materials considered by KDD as necessary "upon consultation."

5. Paragraph 3 of the agreement allowed KDD to monitor the leased line, and paragraph 4 allowed KDD to enter and inspect the installation site.

The most restrictive policy of Japan related to the limited use of the private leased line from Tokyo to Cleveland, Ohio. This line was utilized to only ten percent of its capacity, and yet we were forbidden to sell other data services in Japan unless we were willing at high and competitively uneconomical cost to purchase one leased line for each center where any of this activity was processed in the United States. Control Data enlisted the aid of the U.S. Special Trade Representative, the Department of State, the Department of Commerce, all to no avail. It was not until KDD applied through its corresponding U.S. international record carrier for a Federal Communications Commission 214 certificate essential to bring into the United States its VENUS/ICAS packet switched services that there appeared to be any break in the clouds.

It was not until five years later, in 1981, after constant search for relief, that we were eventually able to enter into a modification of our agreement with KDD to permit the use of our international leased line in a manner which permitted an effective and competitive data services offering to be provided by Control Data in the marketplace.

In summary, through constant delaying tactics by the Japanese, Control Data took nine years, at a cost of tens of millions of dollars to establish competitive data services in Japan.

Question 2 - Is the picture of Japanese technological policy conveyed in your statement largely related to the electronics industry or are there other industries which benefit, in similar ways, from government sponsored R&D?:

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I claim no special knowledge of targeting by the Japanese in industries other than microelectronics and computers, but from publicly available information sources, including the U.S. Department of Commerce, it is apparent that electronic instruments, lasers, optical communication, biotechnology, robots, aerospace and telecommunications industries are other examples of targeted industries which benefit from government supported research and development.

Question 3 - You mentioned the phenomena in this country of "short-term investment horizons." What can we do to get away from such shortsighted approached? What is it about the Japanese approach to management that enables Japanese firms to look further down the road? Will a greater emphasis on RJV's in this country help alleviate the pitfalls of short-term investment horizons?:

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There are several factors which accentuate the phenomenon of short-term investment horizons in the United States compared to those in Japan. I believe that a principal cause is due more to the different business environment within the two countries than to differences in management approach between Japan and U.S. firms. A salient example is the cost and availability of long-term, low-cost capital.

International differences in the availability and cost of capital are crucial in rapidly growing high technology industries with enormous competitive benefits for firms which are able to undertake rapid anticipatory expansion with its attendant benefits of decreasing unit costs.

According to U.S. government figures, in 1981 Japanese industrial corporations on average faced financial capital costs of 9.2% compared to 16.6% for U.S. firms. This differential in capital costs is very striking in its impact. For example, the total cost of 100 million dollars investment financed over fifteen years at 16.6% exceeds 900 million dollars. This same investment financed at 9.2% costs only 374 million dollars. Thus, the stream of returns necessary to cover capital costs over this period is two and one-half times greater in the U.S. than in Japan. This circumstance will drive most businessmen to a more conservative investment policy regardless of their national origin. The condition is exacerbated by the Japanese willingness to provide funds to Japanese firms which operate in target industries at even more favorable rates than the average.

The high capital costs faced by U.S. corporations increase both the absolute investment threshold and the uncertainty attached to the firms' ability to recover investment costs. The capital cost gap has widened in recent years because of the greater return demanded by U.S. lenders to compensate for the higher rate of inflation in the U.S.

Japanese corporations benefit from a close and long standing relationship with their government and with lending institutions. This results in relatively low risk premiums, but more importantly, in a more assured supply of funds. This tendency is strengthened in Japan by commercial banks' confidence that they have little to risk in lending to firms which are members of industries targeted by their government. The close relationship between banking and industry has led to high debt to equity ratios which in Japan average two to one compared with a one to two ratio in the U.S. The impact is particularly great in the U.S. where dividends (the interest on equity capital) are taxed at normal corporate rates, whereas in Japan, according to U.S. Government reports, tax breaks on distributed income have been enacted to avoid double taxation of dividend income.

Given the reduced availability of long-term, low-cost debt, U.S. firms are significantly more dependent on the equity markets than is the case for Japanese firms. Achievement of equity financing at reasonable cost requires a high stock price which in turn requires high and stable earnings. Thus, U.S. businesses are implicitly encouraged to favor short-term investments which can produce earnings gains in the short-term.

There is no doubt that the existence of research joint ventures in the U.S. will help alleviate some of these problems. It is particularly so with Microelectronics and Computer Technology Corporation, where the research emphasis is on those areas of advanced technology which have the dual characteristics of high cost and high risk.

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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

7 SEP 1983

The Honorable Doug Walgren
The Honorable Albert Gore, Jr.
Chairmen, Subcommittees on Science,
  Research and Technology and
  Investigations and Oversight
House Committee on Science and Technology

Enclosed is our response to your letter of August 2, 1983, asking four questions to supplement the record of our June 29, 1983, testimony before your Subcommittees. If we can be of further assistance, please let us know.

Sincerely yours,

Allan I. Mendelowitz
Associate Director

Enclosure

RESPONSE OF ALLAN I. MENDELOWITZ TO QUESTIONS FROM CONGRESSMEN GORE AND WALGREN

1. Could you elaborate on the importance of "consensus building" in Japan? What is the role of consensus building in MITI's formation of industrial policy? What can we in the United States learn from the consensus building approach to Japanese decisionmaking?

   There are three primary effects of consensus building which we believe are beneficial to Japanese decisionmaking. First, through this consensus building process, MITI obtains important information upon which to base policy decisions from industry, labor, academia, and so on. Second, the consensus building process permits a general exchange of views between government, industry, labor, and others, about problems and issues to be addressed and future goals, and generally helps develop and reinforce a constructive working relationship between various elements in society. Finally, through consensus building the government is able to mobilize support around a preagreed policy thus making fulfillment of policy goals easier. Although time-consuming and sometimes highly contentious, we believe that one of the aspects of consensus building which could prove beneficial to the United States is that which engenders a constructive working relationship between government, business, and labor. It should be noted, however, that consensus solutions may avoid hard but necessary decisions.

2. You have noted that many Japanese conduct their own research even while participating in MITI-supported programs. What policy instruments does MITI use to coax companies to participate in joint research programs? Are there industries where Japanese companies prefer to go it alone?

One of the major policy instruments is government funding (partial or full) of research and development programs. The risk-reducing effect of such funding is highly desirable to companies, particularly those engaged in high technology R&D. A similar risk-reducing effect is achieved through joint government-industry research projects and government efforts to assist in the diffusion of technology through such mechanisms as tax incentives and leasing companies. Japanese firms, not unlike U.S. firms, are at times hesitant to accept government assistance because of the strings attached to this assistance. Today, companies which attempt to keep an arms-length relationship with the government are those such as auto and consumer electronics firms. Until their decline in recent years some shipbuilding and steel firms were also hesitant to accept government assistance. It is extremely difficult to assess the benefit of government funding of R&D programs on industries not directly receiving these funds, for example, the contribution of the VLSI (very large scale integrated circuits) program to the consumer electronics industry--although there is a general belief that the effect was significant.

3. In the past, the Japanese Ministry of Finance has been able to maintain a tight hold on credit allocation, thereby enabling the MOF to influence the direction of industry investment. Does the situation still exist?

The system of credit rationing was perpetuated effectively in an era when private access to foreign and domestic capital markets was controlled, and when Japanese companies were financially dependent on debt financing. Today, controls on access to many capital markets have been considerably reduced, while the financial strength of Japanese companies has improved dramatically. Thus, credit rationing as a means to direct and control investment has weakened. Today, market factors more directly influence credit allocation than previously; however, Japanese banks have stated that government support of a project reflects favorably on that project and continues to influence bank lending decisions.

4. You have described a number of policy instruments employed by Japan to promote research and technology diffusion. Among them are tax incentives, government-sponsored leasing programs and success-conditional loans. Which among these instruments might be built into a U.S. industrial policy?

Many of the policy instruments discussed in our reports are already available to U.S. industry, for example, tax incentives in the form of special depreciation allowances and credits, government procurement, government funding of R&D, the ability to do joint research, and so on. Furthermore, tax considerations have encouraged private sector equipment leasing companies. Japan focuses these incentives more than we do on achieving specific industrial goals. If an industrial policy were to be developed in this country, it would be logical to expect that a coordinated goal-setting effort would be central to that policy.

QUESTIONS FOR ROBERT S. COOPER

Q Do you believe that the Japanese can achieve an artificial intelligence computer capability within the 10 years they have prescribed for the task?

Q You have indicated DARPA's interest in coordinating its research joint ventures that are now underway. Nevertheless, do you believe that the present system in which the military and private sectors undertake research aimed at different but sometimes overlapping goals is an adequate response to the coordinated Japanese ICOT project? Put differently, given the far greater percent of R&D dollars that we in the United States spend on defense, how can we best arrange our national research effort to respond to the Japanese effort?

Q Assuming DARPA's proposed Strategic Computers and Survivability program is funded, what steps will DARPA take to rapidly transfer its technological findings to the private sector so that they can be commercially exploited in a timely manner?

Q Dr. Fiegenbaum and Mr. Arai testified that the Japanese ICOT program is an open one. If true, has DARPA given any thought to coordinating its research efforts in the area of artificial intelligence with those of the Japanese.

Japanese Technological Advances

Question: Do you believe that the Japanese can achieve an artificial intelligence computer capability within the 10 years they have prescribed for the task?

UNCLASSIFIED

Dr. Cooper: The Japanese have already made substantial progress in Artificial Intelligence and there is no doubt they will make steady progress in the next 10 years. It is difficult to believe they will achieve all the goals they outlined in their 5th Generation program, but even a small set of such accomplishments could allow them to attain world leadership, if we are not diligent in pressing ahead ourselves.

UNCLASSIFIED

Question: You have indicated DARPA's interest in coordinating its research joint ventures that are now underway. Nevertheless, do you believe that the present system in which the military and private sectors undertake research aimed at different but sometimes overlapping goals is an adequate response to the coordinated Japanese ICOT project? Put differently, given the far greater percent of R&D dollars that we in the United States spend on defense, how can we best arrange our national research effort to respond to the Japanese effort?

Dr. Cooper: The present system in which both the military and private sectors undertake research with different but somewhat overlapping goals is healthy and adequate provided a sufficient overall research investment can be made. The U.S. tradition of decentralized research management with open publication of results and strong coordination through information exchange has worked well for us in many research areas in the past. I am confident that this approach, which favors diversity and competition of ideas, will assure a favorable U.S. competitive position in our future competition for world markets in the computer field. With very few exceptions, the underlying technological goals in this area are almost identical in both industry and the military. Although the end applications may differ, the same technology usually applies. In my view, greater incentives should be provided by law to encourage long term R&D investments by industry and efforts should be made to seek reciprocity in foreign trade and industrial agreements. These incentives plus a significant Defense R&D investment within both industry and the nation's universities will, I am sure, guarantee a strong and vigorous industrial base.

Japanese Technological Advances

UNCLASSIFIED

Question: Assuming DARPA's proposed Strategic Computers and Survivability program is funded, what steps will DARPA take to rapidly transfer its technological fundings to the private sector so that they can be commercially exploited in a timely manner?

Dr. Cooper: The initial activities will focus largely on micro-electronics, architecture and development tools which will heavily involve industrial participation. Joint university/industry architecture efforts will be used to couple the best ideas in academia with the manufacturing know-how of industry. Applications will largely be carried out by industry. By involving industry directly from the beginning, the transfer process will happen both naturally and rapidly.

UNCLASSIFIED

Question: Dr. Feigenbaum and Mr. Arai testified that the Japanese ICOT program is an open one. If true, has DARPA given any thought to coordinating its research efforts in the area of artificial intelligence with those of the Japanese?

Dr. Cooper: Although the efforts at ICOT appear to be open, and the Japanese 5th Generation plan was widely disseminated, there are undoubtedly numerous efforts underway in Japan for which information cannot be obtained. I plan to visit Japan in the near future to see firsthand what they are doing in this area, and to assess the possibility of some coordination. However, I would have to be convinced that the U.S. would stand to gain at least as much as the Japanese from such an interchange. This is not at all certain at this time.

QUESTIONS FOR J.F. MATHIS

Q The day prior to your testimony, we heard testimony from a nonprofit research joint venture in the semiconductor industry. As with CIIT, the Semiconductor Research Corporation represents most of the major companies in its industry. Do you see the potential for CIIT-type organizations in other industries?

Q In general, do you believe that U.S. industry is ready to share research in the way that the chemical and semiconductor industries are now sharing research?

Q Have any antitrust issues arisen since the formation of CIIT?

Q The day prior to your testimony, we also heard from the MCC Corporation, a for-profit research joint venture in the semiconductor field. Do you see any potential for such for-profit collective research activity in the chemical industry? To your knowledge, have any such ventures been considered in the chemical industry, but rejected due to concerns over antitrust litigation?

J F MATHIS
Vice-President - Science & Technology

September 15, 1983

Mr. Jerome Ostrov
U.S. House of Representatives
House Annex #1, Room 822
300 New Jersey Ave. S.E.
Washington, D.C. 20515

Dear Mr. Ostrov:

I appreciate the comments of Congressmen Walgren and Gore (letter of August 2) on my testimony regarding the Chemical Industry Institute of Toxicology (CIIT) before the July 12 hearing of the Science, Research and Technology Subcommittee. If they found the testimony helpful to their consideration of antitrust legislation, that is in a sense a tribute to the careful thought which was given to the organizational design and operation of CIIT.

We have considered the four follow-up questions concerning industry associations which were posed in the August 2 letter. You undoubtedly recognize that the general subject of industry associations, their objectives, composition and legal ramifications, is very broad. The responses which we have developed are limited but they suggest fruitful areas for your further study.

As background for my specific answers, I would like to note that we see a significant difference between the research objectives of an industry association such as CIIT and those of the Semiconductor Research Corporation (SRC) or the Microelectronic and Computer Corporation (MCC), all of which are mentioned interchangeably in your questions. CIIT is working primarily toward social objectives (sometimes given concrete expression in government legislation) for which industry has a major responsibility or capability but for which no direct economic return is envisioned. Such objectives may involve health, environment, safety, measurement standards or other areas of general public concern. The research programs in these areas may have various commercial effects, but there is no intention that they yield any economic return. On the other hand, research organizations like SRC and MCC have commercial objectives, albeit long range and in the national interest. It appears that their approach will involve conducting basic research to generate scientific information which will be given or licensed to the whole industry to form the basis for subsequent commercial developments. Some economic return to the industry is foreseen, eventually.

Following this line of thought, we believe in answer to your first question that organizations with purposes similar to CIIT's already exist in the chemical, petroleum and other industries. However, the organizations are quite varied in their organizational structure, breadth of research purposes, means of funding programs, and facilities for conducting the research. Some examples from the chemical and petroleum industries are shown in the attachment. We believe that the same kind of variety exists in other industrial sectors, e.g. steel, paper, food, drugs, and that there are other industry sector crossover organizations like the Coordinating Research Council, shown on the attachment. For example, the International Life Sciences Institute, which develops scientific information on selected issues involving public health and safety, is supported by the food and drug industries. In summary, there may be

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very few organizations in other industries which are identical to CIIT in structure. However, there should be many effective industry organizations with objectives which are similar to those of CIIT, which could be identified through further investigation.

We viewed your second question as encompassing industry organizations which share basic research for long term commercial reasons, rather than for purposes of public health and welfare. In general, we do not believe that, outside the microelectronics field, many of these exist. The probable reason is that most sectors are not ready to share research in the same manner or to the same degree as the semiconductor industry appears to be, because the companies wish to have and maintain a proprietary position if at all possible. One significant exception seems to be university-based consortia supported by a group of companies. Some examples include: the Polymer Processing Program supported at MIT by ten companies; the University of Delaware consortium on catalysis funded by 18 companies; the Stanford-University of California program to develop genetic engineering processes, which is supported by about six companies. It is worth noting that, of some 15 industry-university cooperative research efforts given seed money in 1973 by NSF, the MIT Polymer Program is the only one which has survived. Therefore, while industry-university relations are undergoing considerable change, it is difficult to predict whether such consortia will increase in number and significance in the future. Outside of universities, we see no evidence of unusual growth in cooperative industry research programs for commercial objectives.

In response to your query concerning antitrust matters which have arisen since CIIT's formation, none of any importance have arisen. The fact that this is the case may be attributable to the considerable thought put into the design of the organization's structure and policies, and to the high sensitivity of the CIIT management and Board of Directors to antitrust concerns.

To our knowledge, no interest has been shown by the chemical industry in the type of "for-profit joint research venture" which is noted in your last question. Perhaps the lack of incentive for such collective chemical research stems from the proprietary nature of the research (i.e. largely application and development work) which is needed to gain a competitive edge in products or processes, and the limited cost of any single research project, even when carried through the demonstration phase. In any case, we do not know of any collective chemical research ventures which have been considered but rejected for antitrust reasons.

Again, we appreciate your interest in CIIT and hope that our responses to your questions are useful.

Very truly yours,

JFmathis

JFM/ef

cc: Mr. M. R. Wessel

EXAMPLES OF INDUSTRY ASSOCIATIONS DOING RESEARCH ON ENVIRONMENT, HEALTH, SAFETY

- Chemical Industry Institute of Toxicology (CIIT)
    - Membership open and composed of individual companies which are part of or associated with the chemical industry.
    - Research directed at health effects of chemicals, and results published.
    - Funding from CIIT budget.
    - Research conducted largely in CIIT's own facilities.

- Coordinating Research Council (CRC), sponsor of the Air Pollution Research Advisory Committee (APRAC)
    - CRC "membership" is the American Petroleum Institute (API) and Motor Vehicle Manufacturers Association (MVMA).
    - Research focused on air pollution causes and effects and results published; advice of U.S. Environmental Protection Agency often sought.
    - Programs funded by API and MVMA.
    - Conduct of research is almost entirely in independent labs and universities; may use industry member labs only if some unique facility is needed.
    - CRC also surveys and publishes industry data of potential consumer interest, e.g. octane requirements of car population, etc.

- American Petroleum Institute (API)
    - Like CIIT, membership open to all industry members.
    - Unlike CIIT, API serves many industry purposes and the research which it sponsors is also highly varied; environmental and health research, beyond that funded through the CRC-APRAC, is conducted in a broad, multifaceted program.
    - Research funding is from the API budget, but API will also participate in cooperative programs which may be partially funded by others, e.g. the U.S.-EPA.
    - Research facilities are largely those of university labs or independent labs; API's policy is not to use member company labs unless there are very special circumstances.

- Chemical Manufacturers Association (CMA)
    - Similar to API in terms of membership, variety of environmental health research undertaken, and use of independent research facilities.
    - Differs from API and CIIT in that funding for each research project comes from those members with a particular interest in the project, not from the general budget.

- Antimony Oxide Industry Association (AOIA)
    - Like CIIT, the organization is concerned only with health and environmental effects, but is narrowly focused on antimony oxide.

  - Like the API and CMA, the AOIA is open to all interested parties, but its membership of about half a dozen companies is much smaller than the hundreds of companies in the API/CMA.
  - Research funding from the members, although research programs are developed with advice from U.S.-EPA.

- Gulf Universities Research Consortium (GURC)

  - Composed of about 20 universities which conduct the major share of research on selected environmental programs (as well as research in other areas).
  - Industry associations can request GURC assistance in planning and conducting environmental studies.
  - Funding for environmental projects comes largely from industry and government, with some sharing by the universities.

9/15/83

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Productivity, Technology and Innovation
Washington, D.C. 20230
(202) 377-1984

SE[illegible]983

Honorable Doug Walgren
Honorable Albert Gore, Jr.
Committee on Science and
  Technology
House of Representatives
Suite 2321, Rayburn House Office Building
Washington, D.C. 20515

Thank you again for the chance to testify on Joint Research Ventures at your June 30 hearing. Enclosed are responses to the further questions that you sent.

I cannot emphasize too strongly the importance to the future competitiveness of U.S. industry of clarifying our antitrust laws. I would like to repeat my offer of support for the work your Subcommittees are doing in this important area.

Sincerely,

Egils Milbergs for

D. Bruce Merrifield

Enclosures

Q. In your statement, you mentioned Genentech as an example of an RDLP. Presumably, you would also classify the semiconductor industry as a suitable candidate for RDLP financing. Are there many other industries that lend themselves to your model?

A. Research and Development Limited Partnerships (RDLPs) are suitable mechanisms for funding any new product or process requiring R&D, that is five years or less from commercialization and that can demonstrate technical and market feasibility to potential investors. Therefore, RDLPs are not just appropriate for "high technology" industries; they are equally applicable to new technology for "mature" industries. In fact, a company (including start-up companies) or group of companies within almost any industry is a candidate for financing through a Research and Development Limited Partnership. A university, consulting firm, etc. can seek funding as a General Partner through an RDLP as well.

Q. You note that "U.S. firms have consistently expressed the view" that the antitrust laws inhibit research joint ventures. Is there anything more tangible than "expressed views" to support the claims being made by industry?

A. The antitrust laws present two types of concerns to anyone interested in carrying out joint R&D. The first is the possibility of suits by the Department of Justice. The second is the threat of treble damages from private action suits. Each of these is discussed in turn below:

A survey done in 1975 by the Industrial Research Institute for the Commerce Technical Advisory Board found that fear of antitrust violation was a constraint on collaborative research. (The study was titled "Institutional and Legal Constraints to Cooperative Energy Research and Development". We would be glad to provide a copy upon your request.) The study concluded that this concern had a real impact on R&D planning by management. Three specific cases mentioned of research and development being inhibited by antitrust constraints were: the Inter-Industry Emissions Control Program which involved a number of large oil and auto companies; the Smelter Control Research Association involving the copper industry; and the suit brought against the aircraft industry (U.S. v. Aircraft Manufacturer's Association) in which every major American manufacturer of airframes was charged with engaging in illegal association to suppress competition in the research and development of aircraft.

Even after the Justice Department issued formal guidelines on joint R&D ("Antitrust Guide Concerning Research Joint Ventures," November 1980), U.S. Steel entered into discussion with Justice to encourage further loosening of the guidelines.

Attached is a recent press clipping of an article in which David Roderick outlines the steel industry's views in this area.

The second major deterrent is treble damages resulting from possible private suits. Private suits can follow Justice litigation, or can be initiated even where Justice feels it doesn't want to challenge an arrangement. Further, William Baxter, Assistant Attorney General for Antitrust, has stated that treble damages are a "great deterrent" to joint ventures. Treble damages may actually create an incentive for litigation.

Q. In your statement, you expressed concern for the ability of small firms to engage in research. Is it clear that promotion of the research joint venture concept is the answer to this problem? Put differently, what assurances are there that small firms will be able to afford RJV membership?

A. There are no "assurances" that smaller firms will be able to afford membership in joint research ventures. In practice, however, many such ventures have special provisions to encourage participation by small firms. An example of this is the Semiconductor Research Cooperative.

RDLPs are a different form of cooperative research than ventures like the Microelectronics and Computer Technology Corporation, in which members pay to participate. Any size firm can establish an RDLP, which is funded by limited partners at "arms length" from the general partner and research organization. Small firms benefit in that they can perform R&D and own the results of that research (e.g. patents) on a scale they could not fund on their own.

Since investment in an RDLP by a limited partner is based on the expectation of profit, it is our view that market forces would encourage investments in RDLPs initiated by small as well as large companies.

Q. In addition to the European Airbus joint venture referred to in your statement, are there other European RJVs of note? Is the Boeing 767 effort, which was based on U.S., Italian and Japanese inputs, an analogous situation? If so, do you see International RJVs as being an attractive approach in less costly industries than aircraft?

A. The European Economic Community has exempted a number of collaborative research agreements between individual member countries from the antitrust restrictions of their Treaty. Joint R&D has been authorized in such areas as nuclear oxide fuels and electronic components.

Other specific European joint research ventures include: the Ariane Space Project; ESPRIT (European Strategic Program for Research in Information Technology); and an EEC-sponsored venture on Computer Aided Design for Very Large Scale Integrated Circuits for the telecommunications industry. The last project is called CVT, with France, Germany and Italy participating. Another cooperative venture, in the area of high temperature new materials for energy systems (Cooperation European dans la Domaine de la Recherche Scientifique et Technique - COST), has as participants Denmark, Finland, France, Italy, the Netherlands, Norway, Austria, Switzerland, Sweden, the United Kingdom, and West Germany.

The Airbus and Boeing 767 projects are quite dissimilar. The Airbus is funded largely by the participating governments. The Boeing arrangement with Japan and Italy is a private arrangement involving no U.S. government funding. The Airbus involves both the development and production of the aircraft. The 767 was developed by Boeing with little technology from Japan and Italy. The Japanese and Italians are essentially subcontractors to Boeing, responsible for producing specified parts of the airframe and final design of those parts. Since Japanese and Italian R&D contributions to the 767 are probably less than five percent of the total, I would not characterize the 767 arrangement as a research joint venture. It is primarily a co-production arrangement.

International research joint ventures are a positive approach that will occur more frequently as greater amounts of capital are needed for increasingly complex technologies, and as there continues to be a shortage of qualified personnel.

Q. In your statement, you noted several elements required to maintain U.S. technological competitiveness. One of the elements referred to was sound management. Do you believe current U.S. management of R&D is sound? Are there any industries, in particular, that stand out as exemplary R&D models to be followed by other industries?

A. Criticisms of American management have included the observation that managers have looked to short-term returns rather than taking a longer-term perspective. Such short horizons naturally affect investment in R&D, which requires a commitment by management to funding and resources in order to bring a product through the innovation stages to market. However, statistics for R&D show that between 1975 and 1980, there was an annual increase of 3.8% in industry support of basic research, 6.2% increase in funding for applied research, and 6.5% spending for development. The Federal Government's share of spending decreased (from 20% to 16% for research and 13% to 11% for development), and industry's share increased correspondingly. (Source: National Science Foundation, "National Patterns of Science and Technology Resources, 1982).

U.S. management increasingly will need to be the management of continous change, as world forces (new technologies, new strategies like the Japanese targeted industry strategy, emergence of lesser developed countries) restructure U.S. and world economies. Different companies have been more responsive to this challenge than others. Certain U.S. companies, of course, stand out as leaders in management of R&D - IBM, AT&T's Bell Labs, 3M, G.E. DuPont and Monsanto are examples of sound R&D management.

However, we risk losing the advantages provided by such leaders, as other nations whose companies do not operate under the same antitrust constraints as ours target, for example our microelectronics and fiber optics industries. The Japanese have captured nearly 50% of the numerically controlled machine tool market and nearly 70% of the 64K market in the U.S. It is very important that we modify our antitrust laws so they no longer operate as impediments to competitiveness of U.S. industry in world markets.

Wash Post 5/26/83

Steelmakers Call for Easing Of Restrictions on Mergers

By Warren Brown
Washington Post Staff Writer

NEW YORK, May 25—The chairman of the nation's largest steel company today called for "a more liberal interpretation" of federal antitrust laws to permit mergers and joint ventures between domestic steelmakers that could go out of business if forced to stand alone.

"The federal government should adopt a policy which helps create a more competitive steel industry capable of competing with any nation," United States Steel Corp. Chairman David M. Roderick said.

"A more liberal interpretation of the laws regarding mergers is necessary if this is to be so. If such interpretation is not possible, enabling legislation should be enacted so that the steel industry can continue to remain within the private sector as a world-class competitor," Roderick said in his capacity as chairmen of the American Iron and Steel Institute, which is holding its 91st general meeting here.

Much consolidation of existing steelmaking capacity in the United States, within and across corporate lines, "could be accommodated under present statutes" if federal officials are willing to view the industry as a collection of facilities, as opposed to a group of companies, Roderick said after his speech.

A steel industry push for new antitrust laws would come only if the liberal interpretation approach "proves unworkable," he said. In any case, what is needed is a body of law reflecting the global business conditions of 1983, "not something that is in keeping with the business climate of 1890," Roderick said.

"To continue looking at the steel industry as if the only producers were domestic companies located in a very limited geographical area . . . just doesn't mean a whole lot in 1983," when domestic steel, currently in its worst economic slump since the Great Depression, is being battered by foreign competition, Roderick said.

Some Wall Street analysts agree. "What you have in a lot of cases are steel plants that have been partly modernized, but very few that have been completely modernized," said Charles A. Bradford, an analyst with Merrill Lynch, Pierce, Fenner & Smith, Inc., in response to Roderick's remarks. "That means you have some companies with great casting mills, but poor raw steel production facilities."

Such companies may not have the capital to upgrade their production plants. And their failure to make needed improvements could lead to total shutdown of their operations, Bradford said. Under eased antitrust laws, steel companies with strong production facilities, for example, could merge with those having strong casting facilities, thereby avoiding the complete shutdown of both companies, Bradford said.

Had eased antitrust laws been in effect, the nation might have been able to save some of the 200 domestic steel facilities that have been closed permanently since 1974, Bradford said.

According to other analysts here, some domestic steel companies that might benefit from merger include Jones & Laughlin Steel Corp., a subsidiary of The LTV Corp., and Republic Steel Corp.

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CONTROL DATA
CORPORATION

September 13, 1983

The Honorable Doug Walgren, Chairman
Subcommittee on Science, Research and
Technology

The Honorable Albert Gore, Jr., Chairman
Subcommittee on Investigations, and
Oversight
Committee on Science and Technology
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Representatives Walgren and Gore:

Enclosed are responses to the questions you raised in your letter of August 2, 1983 following my testimony before the Subcommittees of the House Committee on Science and Technology.

If you wish, I would be delighted to discuss further the need for R&D Legislation at any time.

Sincerely,

CONTROL DATA CORPORATION

Steven J. Olson

SJO:ahm
cc: J. Ostrov
W. Bedesem

QUESTIONS FOR STEVEN OLSON

Q Though you advocate clarification of the antitrust laws, the fact remains that, guided in part by your legal advice, MCC has come into existence. Why do you feel that other prospective research consortia won't be able to follow suit?

A. If anything, the MCC experience has underscored the need for legislation. First, despite obvious resource shortages in the face of increased demands on those resources, and despite the urgency demanded by the world competitive situation, it took over 18 months for MCC to proceed from an idea to a corporate shell. Even now, nearly two years later, MCC has yet to engage in any research. During that period, Bill Norris and Bob Price, respectively Control Data's chairman and President, devoted countless hours trying to overcome the skepticism and reticence of executives less familiar with a cooperative approach to problems. Repeatedly encountered was the so-called "Barrier" of U.S. antitrust laws,--a conviction by many executives that irrespective of MCC's legality, such cooperation was inevitably an invitation to become a defendant in at least one horrendously expensive and time-consuming law suit. The task would have been significantly more effective and timely if one could have pointed to an antitrust "safe-harbor" for what is clearly pro-competitive cooperation. And without this, I am skeptical that executives in other companies or industries will have either the inclination or time to devote to similar efforts.

Second, the launch of MCC is but the first step in its journey. And already:

- A San Francisco antitrust lawyer, who generally represents treble-damage plaintiffs, has written a threatening letter to each MCC shareholder.
- The Justice Department has opened another expansive investigation of MCC.

Such events are certainly a "warning" to other potential joint venturers that the road ahead of them is anything but paved.

And finally, the simple formation of MCC does little to placate the general perception by executives that the antitrust risks of cooperative R&D outweigh its benefits. This is because the incentives to attack ventures only peak years after their formation, when they have been successful--in the sense of developing new and usable technologies, which by definition create a potential class of plaintiffs whose "ox has been gored" by such new technology. Thus, executives sense a totally no-win situation--where there are not only the normal risks of failure but also the abnormal risks of success.

In summary, while it is possible that similar ventures will follow the MCC lead, I am not optimistic. Both the historical absence of significant cooperation in R&D and the MCC experience itself are loud testimony to the deterrence of an ambiguous antitrust environment.

Q In your statement, you support the self-certification approach to clarifying the antitrust laws in support of research joint ventures. How would you deal with the following issues that have been raised in conjunction with the self-certification approach:

B(1) What opportunity for comment would be available to a concerned citizen or competitor at the outset? Put differently, is there an administrative-type comment mechanism that can be made available to interested persons who may wish to raise issues regarding an RJV but who do not, at least at the outset, wish to challenge it in court?

A. Several of the bills (e.g. H.R. 1952) specifically require that certain information be filed with the Attorney General before a venture is qualified for any of the protection afforded by their other provisions. In addition, such filings are required to be made available to the public under the FOIA (H.R. 1952--Section 5). I believe that this requirement not only assures DOJ awareness, but also public awareness--and as to the latter, any interested persons are then able to raise whatever issues they wish, with the DOJ or in any other forum. I don't believe a "formal" comment mechanism would add anything (other than bureaucracy) and, indeed, could actually tend to restrict the options open to such parties. If absolute assurance of public awareness that a qualified venture is being formed is desired, I would not find objectionable a requirement that the DOJ "publish" a notice of each filing, in the *Federal Register* or elsewhere.

B(2) How can we best ensure that self-certified RJVs remain within their statutory charter? This issue is of particular significance where, in addition to self-certification, the proposed statutory mechanism discourages private antitrust suits by eliminating the treble damage inducement and by establishing the potential for plaintiff payment of attorney fees.

A. Some of the proposed bills require an annual refiling and recertification by qualified ventures (e.g., H.R. 1952--Sec. 5(b)). Thus, again, both the DOJ and the public would be in a position to identify and challenge any departures from compliance. In addition, by definition, if a venture exceeds the statutory charter, it and its members are no longer in a safe-harbor, but are, if in violation of the antitrust laws, subject to attack by enforcement agencies as well as private parties for at least single damages and attorneys' fees (and probably treble damages if the "excessive" actions are per se offenses). Finally, some bills (e.g., H.R. 1952--Sec.4(d)(2)(B)) include provisions requiring "outside" directors as a further check on the activities of the venture.

B(3) While the self-certification approach will likely discourage any suits, would you agree that a determined plaintiff could still sue a self-certified RJV under a variety of grounds? For example, might not a suit for injunctive relief be brought irrespective of the statutory structure? If correct, what is the real advantage in the clarifications that are embodied in the self-certification proposals?

A. An imaginative plaintiff's lawyer never has difficulty coming up with theories for lawsuits. So here, suits can be started alleging a failure to meet the self-certification requirements or violations of law for engaging in activities allegedly beyond those permitted. The legislation should not totally preclude such challenges (although, I might add, simple failure to meet the self-certification requirements does not, in and of itself, equate to a violation of law). But the real advantage of the proposed clarifications are that they define objective, understandable "safe-harbor" standards to guide business persons in establishing and operating research ventures.

So long as the standards are satisfied, the venture partners can be satisfied that they are protected against successful lawsuits. And by allowing venture defendants who prevail in litigation to also recover their costs and attorneys fees (e.g., H.R. 1952--Sec. 6(2)), the incidence of frivolous "shake-down" lawsuits should also be diminished.

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October 3, 1983

Mr. Jerome Ostrov
House Annex #1
Room 822
300 New Jersey Avenue, S.E.
Washington, D.C. 20515

Dear Mr. Ostrov:

By letter dated August 2, 1983, Mr. Albert Gore, Jr. and Mr. Doug Walgun have requested that I furnish your office with certain information supplementing my Statement before the Committee on Science and Technology regarding the application of the U.S. antitrust laws to research joint ventures. The text of the questions addressed to me and my responses thereto are set forth hereinbelow:

QUESTION 1: If the rule of reason approach is now applied to RJV's, what benefit would a statutory clarification of this doctrine provide? What risks would it entail?

If the proposed legislation merely reaffirmed that RSV's were subject to the rule of reason approach, the risks entailed might not be significant. However, the bills before the Committee at the time of the hearings go well beyond that, and would afford the statutory protection or immunity to conduct associated with the RJV, which might be highly anticompetitive. Illustratively, restrictions on independent product marketing, which are *per se* violations of the antitrust law, if collateral to the RJV, would enjoy the statutory protection.

Furthermore, such proposed legislation would confer upon the Department of Justice the responsibility for resolving, under the rule of reason, the anticompetitive effect of RJV's, and presumably the effect and legality of practices or agreements associated with an RJV, which are not per se unlawful. Due to the comprehensive nature of the facts and issues which necessarily arise in the context of any such analyses, it is questionable whether the Department of Justice would have the resources to make the determinations required. This problem is enhanced to the extent interested parties who may be adversely affected are not afforded the opportunity to participate in the Department's decision making process. Furthermore, the proposed legislation does not, and I believe cannot, provide meaningful or workable statutory guidelines to simplify the task.

QUESTION 2: Can you provide examples of improper conduct that might be possible under the guise of an approved RJV. You mentioned the possibility of "exclusive reciprocal dealing agreements" in your statement? Could you elaborate on such practices and how they might be possible under an RJV?

Particularly where a participant's market share is large, ancillary agreements entered into in connection with or under the guise of an RJV may have substantial anticompetitive potential. A good example of this is presented in the agreements entered into between Kodak and several lamp manufacturers during the 1960's and 1970, which came under judicial scrutiny in the case of Berkey Photo, Inc. v. Eastman Kodak Co., 603 F.2d 263 (2d Cir. 1979), cert. denied, U.S. (1980).

In the instances presented in the Berkey case, lamp manufacturers approached Kodak with new innovations regarding camera flashes which were virtually ready for production. Kodak thereupon entered into "joint development" projects with the lamp manufacturers, as a result of which the new flash systems were not introduced into the market or announced until Kodak had sufficient time to develop and market a camera which would be compatible with the new flash systems. As stated in the court's opinion:

> From this and other evidence, the jury could have found in the verdict it returned that, without any technological justification, GE kept a desirable innovation off the market for two years solely to suit Kodak's convenience. There is a hollow ring to a claim of justification by appeal to the need to promote innovation, where the result of the conduct was such a clear loss to consumers.

Id. at 362. The court went on to add that joint development agreements, even when entered into by a monopolist, would not constitute per se violations of the antitrust laws, but nonetheless might generate sufficient anticompetitive potential to trigger inquiry.

QUESTION 3: In your review, do any of the bills provide a reasonable opportunity to challenge a self-certification or Justice Department approval of an RJV?

None of the bills which were before the Committee at the time of the hearings afford third parties any real opportunity to challenge self certification.

QUESTION 4: Would the elimination of treble damages in the context of RJV's have any adverse overtones in other parts of the antitrust laws where the concept of vigilant private attorneys general is encouraged?

The antitrust laws provide for recovery of counsel fees, interest and costs to successful private litigants. Nonetheless, much of the costs of the prosecution of such litigation is not reflected in such expenses, particularly regarding such factors as the interruption of business, the diversion of corporate personnel, costs of experts, non-legal personnel and litigation support facilities. Moreover, the majority of the costs associated with the discovery process, which is typically, albeit unavoidably, lengthy and burdensome in antitrust litigation, is not recoverable as an allowable costs at the conclusion of the litigation. Accordingly, much of the expense associated with complex litigation is never recouped by a successful party. In view of the massive undertaking required for the prosecution of an action under the antitrust laws, even a successful private plaintiff receiving an award of actual damages plus attorneys fees alone typically might not be made whole at the end of the trial. Manifestly, therefore, the elimination of treble damages would tend to discourage the assertion of meritorious antitrust claims.

Accordingly, the elimination of treble damage recovery in the context of RJV's might leave uncontested, not only such ventures which could not survive a rule of reason analysis, but collateral anticompetitive agreements, practices and restraints.

QUESTION 5: Given the existence of the Joint Research Guideline and the absence of case law holding against RJV's, why do you suppose there is so much concern in Congress and in the commercial sector over the so-called chilling effects of the antitrust laws?

As I stated in my testimony before the Committee, I truly believe such concerns are ill founded. While I can only speculate as to the origin of this thinking, I believe that the "chilling effect" may well be an excuse rather than an explanation for industry's limited commitment to basic R and D.

We have to date had a complete absence of empirical proof that the "chilling effects" of the antitrust laws have in fact deterred members of the industrial community from making greater contributions to research or development, either separately or jointly.

Again, I would like to express my appreciation for the opportunity to assist in the legislative inquiry into these matters. If I can be of any further assistance, please contact me.

Very truly yours,

Alvin M. Stein

AMS/ml

Boston University

School of Law
765 Commonwealth Avenue
Boston, Massachusetts 02215

September 28, 1983

Mr. Jerome Ostrov
House Annex #1
Room 822
300 New Jersey Avenue SE
Washington, DC 20515

Dear Jerry:

Enclosed are my answers to your questions. I am sorry for the delay. I also enclose my recent statement, which now responds to the new bills. As you can see, my thinking has evolved.

Sincerely,

Joe

Joseph F. Brodley
Professor of Law

JFB:ml
Encs.

2. Q. Your suggestion that it might be desirable to tie antitrust exemptions to the research needs of specific industries is quite interesting. Who would judge which industries would be eligible and wouldn't the selection process raise its own set of potential litigation problems?

A. Selection would be made by a non-partisan expert commission, whose members might include scientific, engineering, business and legal experts. While their decisions might be challenged so might the decisions and exemptions made under other R&D proposals.

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3. Q. Since, as you state, the rule of reason standard is the judicial standard now applicable to joint ventures, what would be accomplished by legislative ratification of the principle? What might be some of the problems that would arise out of such a pronouncement?

A. Ratification of the rule of reason standard might give some assurance to firms that find the legal environment uncertain due to the absence or judicial decisions in the R&D field.

Problems might arise because the courts have not used the term "per se" in a uniform manner. Sometimes they use it to describe a rule, such as the rule against price fixing, in which no defenses are ordinarily allowed, and in other instances they use it to describe a rule in which some defenses are permitted, such as the rule against tying restrictions. If the provision is enacted, one can expect that defendants will try to attack every simplification or ordering of proof as an attempt by plaintiff to compel the court to follow a "per se approach." But this problem can at least partially be met by legislative history indicating that the provision

QUESTIONS FOR JOSEPH BRODLEY

1. Q. We are concerned about your suggestion that antitrust law changes in the research joint venture arena could have adverse precedential consequences in other areas. Could you elaborate on this point?

A. Some bills would allow creation of unsupervised research cartels in order to induce R&D activity. This is an undesirable precedent, because it could lead other private groups to seek similar permissive treatment. This tends to undermine the basic principle that competition, not cartelization is the best route to economic progress.

Other undesirable precedents are (1) the elimination of the dual public/private antitrust enforcement system, as contained in proposals for government clearance procedures, (2) the subjecting of non-prevailing plaintiffs to attorneys fees provisions even though their suits were brought in good faith and were in no sense vexatious or without substantial foundation, and (3) reduction of damages to single damages, thus eliminating the deterrence function of the private penalty system. The Administration has already indicated its intention to urge similar changes in other areas of antitrust law.

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is intended to be declarative or present law, and by the specific explanation, proposed in the Administration comments, that the provision is not intended to prevent the use of simplifying criteria, such as market share.

A disadvantage of the proposal is that it sets a precedent for legislative intervention in the judicial evolution of antitrust rules. In general, the evolution of presumptive rules of antitrust law is handled best by the judiciary on a case by case approach. Thus, should Congress choose to enact this provision, it might explain that it is intervening by legislation only because the paucity of cases has prevented judicial clarification of the applicable rule of law.

An alternative means of clarifying the legal environment would be for the Attorney General to issue a formal opinion, which in the absence of case law would serve as a legal precedent. I do not mean by this the issuance of mere guidelines, or enforcement standards, but a formally published Opinion of the Attorney General. The opinion would advise as to the antitrust status of R&D joint ventures, declaring the applicability of the rule of reason and the standards of legality under that rule.

Q. You state that, legislative revision notwithstanding, a determined plaintiff could still throw an RJV into protracted litigation. How likely is such a prospect? Whatever the potential for litigation, wouldn't the same potential exist even under the proposals which call for advance Justice Department clearance.

A. I would concede that this is not a likely eventuality, but then neither in my opinion is it likely that legitimate R&D programs will be thrown into protracted litigations by "strike suit" antitrust actions. The difficulty is that the proposed R&D legislation is attempting to respond to perceptions that are not accurate in terms of present antitrust law.

5. Q. In the study you propose, what findings would persuade you of the need to revise the antitrust laws to encourage RJV's? How would the data in support of such findings be acquired?

A. Scientific survey evidence; in depth interviews by neutral investigators; studies of costs and benefits of R&D joint ventures; historical accounts of successful and unsuccessful ventures. These studies could be carried out by business or economic scholars, perhaps commissioned and funded by Congress.

APPENDIX II

Supplemental Information

congressional clearinghouse on the future

555 house annex #2 washington, d.c. 20515 (202) 226-3434

DIALOGUES ON AMERICA'S FUTURE

DR. WILLIAM OUCHI
Professor of Management, UCLA
March 16, 1983

REP. BERKLEY BEDELL:

It is my pleasure to introduce to you Bill Ouchi, who is a professor at Graduate School of Management at UCLA and author of the national best-seller, Theory Z, How American Business Can Meet the Japanese Challenge.

DR. WILLIAM OUCHI:

I think it's possible that my children are not going to be able to look forward to a future in which they can expect to have two cars and a three-bedroom house in the suburbs unless we have the capacity to reinterpret the nature and the relationship between business and government in this country.

Since 1945 we have enjoyed an unprecedented industrial monopoly in the world. At the end of World War II anybody who wanted to buy a new ship, an airplane, a tractor, or an oscilloscope had to buy it here. There were no plants left in West Germany, France, the United Kingdom, or Japan. It had all been devastated. We have just come off a period of 35 years during which we enjoyed complete monopoly, in which firms have enjoyed monopoly profits, labor monopoly wages, and government monopoly taxes. We can all think of companies in our experience that have had the great success of developing a superior product, a better widgit which was protected by patent. For 17 years, that company looked forward to a period of monopoly during which, in effect, the management of the company could have stayed home watching re-runs of "Let's Make A Deal" and drinking beer and their company would have had increasing sales and earnings each year. Whenever such a situation occurs, the stage is set for superstitious learning.

What happens in a company like that is that the management develops over time an elaborate ideology which has both an intellectual and an ethical component which they believe defines the right way to run that business. They learn the ideology deeply because for 17 years they practiced it and it worked. And then one day the patent expires; the competitors appear; and they discover that all that they have learned has been learned superstitiously. It seems to me that there is a good deal about the nature of our relationship which specifies that government should always stay in that corner and business in this corner because both sides feel that whenever they get together no good comes of it. Also when they meet within an industry, Business A should stay in that corner and Business B in that corner and when the bell rings they can come out swinging.

Short of that there should be no contact between them because if we let them talk to one another they will always cheat. I think possibly there is a good deal in that ideology that has been superstitiously learned.

When I look at Japan, as I have over the last three years, with a team of 12 research assistants at UCLA, what I see is quite different from what many of us have come to believe. There is a popular belief that the Japanese economy is a single hierarchy headed by the Ministry of International Trade and Industry (MITI), an elite super bureau which knows all, sees all, and tells each company just what to do. Those who hold such a view are always puzzled by the question: How is it that any bureau can be so good as to have picked six winners in a row? How could they have targeted first steel, then automobiles, motorcycles, consumer electronics, computer mainframe, software, and the unmanned garment factory of the future? How can any bureaucracy pick that many winners in a row? And of course they cannot. And they have not.

What we have done is to study in detail the structure of one industry segment, that is, the electronics industry in the U.S. and Japan. We have compiled the data file which describes in detail all 814 publicly owned companies in that industry in both countries, including the product market structure, the vertical integration, the financial structure, and results. We've done a complete study of all banks in Japan and their financing of that industry for comparison of all banks headquartered in New York City and their financing of the industry in the U.S. We've gone through the Securities and Exchange Commission files, made a list of all of the owners of the companies in both countries, and analyzed those. We've translated all the documents from Japanese into English. We've done a study of 136 trade associations in the U.S. and of 50 in Japan. We've written the history of the development of the computer industry in Japan and in the U.S. We've studied the joint R&D projects in Japan, very large scale integration (VLSI), fifth generation software project, on and on.

In comparing VLSI in the U.S. and the financing of the solar industry, we've found several things. We found that indeed there have been a few occasions on which the Ministry of International Trade and Industry has attempted to take the lead, the initiative, and almost every time they have ended up with egg on their face. They aren't smart enough. No one is smart enough. Just as no factory manager is smart enough to tell every employee just what to do (which is why a more participative form of management succeeds in business) so it is true that no central body can ever be smart enough to tell an economy just what to do. And the Japanese, indeed, have not done so.

We find on every occasion in which there has been a successful partnership between business and government, or a successful collaborative effort between firms in Japan, the initiative has come from the private sector and the initiative taken by an ordinary profit-seeking company attempting to gain benefit for itself, but facing a government which constrains it to take a broader view. Take, for example, the VLSI, a very large-scale integration project of the 1970s. In the early 1970s there were no Japanese companies that had any hope of being competitive in the 64K RAM. Today they hold 65 percent of the world market. Today the Japanese mainframe hardware is competitive with the U.S. industry, mostly because of a successful joint R&D project with the VLSI project.

We tend to think of that project as being one of the examples of MITI guiding the industry, applying administrative guidance, telling people what to do, forming a cartel, with everybody in harmony, in perfect step. But let me tell you what we found. We've tracked down the original directors of that project, interviewed them, talked to the staff that was there at the beginning, and done a thorough analysis. There were, at the time, seven Japanese companies that wanted to have some kind of development in VLSI. Two of them in particular took it upon themselves to go to the government and to say: Look, in all of Japan there are not more than a hundred scientists who are really up to speed on large-scale integration; those 100 people are distributed across 20 or 25 companies with the result that no company is at threshold; no one has critical mass; please endow us with "bags of money" so that we can go out and hire and train people. In a few years we will have developed more scientists so that each company will have a hundred and we will be competitive. The government said: Ridiculous, infeasible, it will look like we're serving a narrow special interest; you'll each want your own deal; there isn't enough money in the bank, and the answer is No, No, and No. But if you can go and make peace with your industry, make peace with the other industry groups who have some interest in this problem, and make peace with the principal union groups, the consumer groups, the academics, and the public, then we can help you.

The companies went to their industry association, the Japan Electronics Industry and Development Association (JEIDA), and said to them: Would you please start a discussion within our industry on this problem. They went to the Keidonran, the federation of economic organizations, which is the equivalent to the Business Roundtable, the National Association of Manufacturers, rolled together and increasing their influence over their members by an order of ten, and said: Would you please bring together the machine tool makers, the auto makers, the consumer groups, the electronics people, all of those industry groups who in the end would benefit from this innovation, and ask if we can start a discussion on this problem. They went to aerospace and electronics, which is one of the 24 discussion councils maintained by MITI and is chartered with overseeing the electronics industries. It has 86 members which represent all of the major associations, labor groups, consumer groups, it even has six journalists on the discussion council. They asked the group to please begin a discussion of the topic. Each of these groups reached out to their own constituencies, to the specialized industry associations and interest groups, and there emerged a long dialogue. Following the discussions, there was a consensus that, yes, there should be some kind of a joint commitment that those who will not directly benefit will not oppose the commitment of the government to the effort. For instance, machine tools will not directly benefit from the effort but will support it because in the long run it will benefit them. They had to give, they had to take, they had to do their bargaining, and they ended up with a position with which all could live.

There are a lot of details that follow on. I won't tell you all of them but I do want to dissuade you from the view, if you hold it, that this is a perfectly harmonious operation. Of the seven companies that wanted in, there was one, NTT, the leader in Japan in VLSI, that refused to join the project because they felt they already possessed the lead in that technology, and had a great deal of proprietary information to lose. They refused to join. Of the remaining seven companies, there were five major and two minor, the five major companies in effect cut out the two smaller companies.

These are not men from Mars, these are not people unlike the human beings who inhabit our economy. These are normal, narrow-minded, profit-seeking, self-interested human beings, but people who are confronted with a set of constraints and incentives that force self-interested people to behave in reasonable ways.

Well, they went to their industry association which drafted a proposal to create a research association under the 1961 Research Associations Law which permits any three or more companies to seek certification. With certification, companies get certain tax benefits with respect to accelerating depreciation on the equipment designed for joint R&D; they had to bring it all up in the first year. More importantly, they get a non-official but pretty effective anti-trust immunity granted not by the Japanese FTC which is the DOJ equivalent, but granted rather by the Agency of Industrial Science and Technology, an office within MITI. The Japanese FTC still can and will bring a suit if the companies should abuse their privilege in the joint project. However, there is constant pressure to confine these joint R&D ventures only to basic research. Basic research by definition is a public good; it is non-patentable. Any society of private property rights will systematically under-invest in basic research for that reason. The companies are always struggling to get defined as basic research that which is really product research so they can get more money from the government. The government is always struggling to push the boundary the other way to keep them down toward basic research and, of course, they err sometimes on one side and sometimes on the other, but on the whole the balance comes out.

What we see here is the locus of a corporate memory -- self-interested people who are confronted with a setting which will remember their generous deeds and their selfish deeds. But that same set of individuals, without an institutional memory, will behave in manifestly irresponsible and uncooperative ways. What we lack in this country is an institutional framework which provides that kind of memory between the public and private sectors. What we lack is the capacity for the private sector to organize its voice in a responsible way. There isn't any good reason why we can't arrange some kind of institutional structure of that sort that subjects the narrow interests of each group to a kind of a dialogue, a kind of discussion.

I remember ten years ago when the idea of participative management was first introduced. People would say: Look, you're recommending that labor and management should sit down and talk to each other more often when as it is they talk every year and a half, whenever there's a work stoppage or renegotiation. The talk is always unpleasant. Who in the world would want to increase the frequency of such unpleasantness? Of course, what they learn is that once they establish a regular dialogue rather than an issue-specific, crisis-specific form of interaction it no longer is painful, that the conversation and dialogue were far more effective.

It seems to me you can say to any manager that a company can deal with a hostile union -- it isn't fun, it isn't easy, but it can be done. A union can deal with a hostile management; again, it isn't easy or fun but it can be done. However, a company cannot deal with a disorganized union, a union in disarray. A union cannot deal with a disorganized management that is unable to reach consensus on its own. A problem I see when I compare the setting in the U.S. to that in Japan is that our government faces not a hostile business community, but rather a disorganized one. It seems to me that it is eminently possible for us to remedy this problem. One of the things that one sees from any kind of a superstitious experience, such as that which I think we may have experienced in the past three decades, is that it leads to rather gross forms of stupidity.

Several people have remarked the Japanese seem to be so brilliant, so selfless, so completely homogeneous in one aspect or another, so completely bound to one another that they possess as a society some underlying assets which we can never emulate. We can never hope to achieve anything like the cooperation they have.

My analysis is a little different. If we look at the issue, for example, of MITI which was begun in 1927 in the formation of the first industry structure council which brought together all the leading business people in Japan to advise the government on these kinds of issues. We see a history from 1927 until 1983 of narrow interest, of turf battles between bureaus, of horrible mistakes being made going too far in one direction and then the other -- a very normal developmental process.

Now what I see is not that the Japanese have been so brilliant, but rather that we have been so stupid. To me that is good news because it implies that in order to fix our problems, we need not be geniuses, we need not be selfless, we need not be homogeneous in outlook. In order to fix our problems simply need to be reasonably semi-rational people, and I believe that we are capable of that.

Let me stop at that point in part because bells might ring at any moment but also because I would like to hear your reactions and attempt to respond to any questions you may have.

QUESTION:

DR. OUCHI:

What they began with was the industry structured council in 1927. What the government said, in effect, to the business community was: We are going to create a council. We are going to give you the opportunity to have some input to the legislative, regulatory, policymaking process in this country. Would you like to take advantage of that opportunity or not? That's all that is necessary. There isn't anyone who will forego that opportunity. One hundred twenty people aren't very many. It means now there is tremendous incentive for the industry groups and associations to discipline themselves and their members to get together and to agree at least on the basics so that they can enter into this dialogue. As you know better than I, the way our industry associations get used in the U.S. today is very different. I was in Florida in the autumn and spoke to one of our industry associations that represents companies that manufacture laboratory apparatus, microscopes and things like that. It was a fairly standard industry association meeting, 200 companies were represented. I spoke one morning, they played golf in the afternoon. Somebody spoke the next morning, they played tennis. Somebody spoke the third morning, they went fishing. Don't get me wrong, I don't in the least disagree, those are reasonable activities and I enjoy them all.

I said to these people, as you're out teeing up this afternoon I want you to think about this: last month I was in Tokyo and visited your counterpart trade association which represents 200 Japanese who are your direct competitors. They are holding meetings that run from 8 a.m. until 10 p.m. Monday through Friday for five months straight so that they can work out their differences on issues of trade policy, legislation, and whatever the defects of government, so they can take their position and then work out their differences with the other industry sectors and go to the government with an understandable position. Now you tell me in five years who's going to be in better shape? People, I think, don't have even the right level of effort in mind when they think about the need for that kind of dialogue.

QUESTION:

Would you comment on the Japanese targeting strategies. In your remarks you seemed to suggest that picking of targets is to people in the industry a sort of random thing rather than their concentrated efforts.

DR. OUCHI:

I would say that the so-called targeting is a consequence of a competitive process that occurs within the discussion councils. Every company and every industry group wants to be on the target list. There isn't anybody who doesn't want to have some tax breaks. There isn't anybody who doesn't want to have some R&D subsidy. There isn't anybody who wants to have some freedom from regulation. Everybody is saying, hey, I'm next. But what occurs is a dialogue, a very broad public dialogue in which the positions get examined by other elements of the private sector. Reasonable people sitting down and persisting in such a dialogue, in the end, are going to come to some kind of an agreement as to what is reasonable and what is not. When the industry structure council takes a position, then MITI has to listen to it.

Now, there is a close coordination. The MITI staff are assigned to ride herd on these discussion councils and to point out that which is completely politically unfeasible, to point out some other elements they might not have thought of, to advise them, to hear from them, etc. so there are no surprises at the end. It is very clear that it is not MITI calling the shots. Now let me observe, however, it is often said that MITI enjoyed substantially more power in the early days than it does today. The Japanese will frequently express such a position themselves as a sop to the criticism of Americans. They feel it simply isn't credible for them to claim otherwise. I have a different analysis.

That's not to say that they hadn't any power. I would say, if anything, they have more power today because today there is less of a consensus. There has been such prosperity that now, as in the U.S., the several interest groups are each beginning to press their own issues. Now it is far more important that there be some kind of agency of government that can help to see whether a consensus can be reached on several key issues. For example, they did reach a consensus three years ago that they were going to place a very high priority on environmental issues, which they had not before. And there followed a whole array of legislative initiatives, of actions on the part of bureaus, on steps on the part of private industry to address those questions. It's very clear, I believe, that the initiative comes from the private sector, not from a central bureau. We've seen the Soviets try to do that and we see how it works, and it doesn't.

QUESTION:

DR. OUCHI:

The view of the MITI bureaucrat is that he is on a tight rope. He has to maintain his credibility with the Diet, with the Ministry of Finance, with the Ministry of Foreign Affairs, with this industry group, that industry group, the Keidonran, the Chamber, the CED. If he embraces one position prematurely or inappropriately he loses all of his following. The only power he possesses is the power possessed by, for example, a division manager in a U.S. company. The only power he has is the power that his subordinates will grant to him if he is doing something useful and doing it well.

Now I will add that there have been abuses by Japanese firms and the Japanese government of U.S. firms, clearly as there have been abuses in this country of foreigners as well, Any company that has been so abused is likely to express the view that there is, indeed, this all-powerful government bureau that has manhandled it. But I think that any serious student of Japan, I think any of our former

Ambassadors, any of the really experienced people in our government who have known Japan well, would express a view sympathetic to that which I have expressed.

QUESTION:

I thought you originally were saying that the Keidonran was a sort of central focus for this power. Maybe you have a broader view of it. In this country if there was a super Chamber of Commerce created that would bring the Business Roundtable with the National Association of Manufacturers and all sorts of groups together, what kind of response would government have to give that sort of organization to achieve the same kind of results that you talked about in Japan? Walk us through what that sort of thing would look like in this country; not that you are advocating it, but if that model were put in place in this country what would it look like in terms of existing structures that we have in this country?

DR. OUCHI:

Well, the Keidonran is an organization which serves primarily the function of forcing one industry which is seeking some kind of special assistance from the government to consider the impact on all other industries who are pressing its case. That's its most important function. You have one industry segment, for example, that is saying they are being murdered by widgits imported from India. The government will first go to the Keidonran and see what these other industry groups export to India and how they feel about the company's position. The company will have to work out some kind of peace with exporting industry groups. You have to keep in mind that the companies are competing with one another and when they get together on these kinds of issues there is a very uneasy alliance. Hitachi and Izuzu do not like the idea of sitting down at the same table to talk about anything. They want to kill each other. They want to take one another's market share away, 100 percent if they can. So it's a setting in which you are having to force people to come to the table in a temporary uneasy alliance so that they can work out some of the technical nature of the problem and then permit the government apparatus to take the appropriate questions of public interest, the political consequence, feasibility, etc.

QUESTION:

Would the Keidonran be illegal in this country?

DR. OUCHI:

No, I don't think so. As I understand it, any companies in this country are free to discuss any issue which will lead to an attempt to influence legislation without fear of anti-trust challenge. The DOJ has said several times that they would give favorable business review letter to any joint R&D proposal from U.S. firms as long as the firms engaging in this joint work together did not comprise more than 25 percent of the world market.

QUESTION:

Your answer assumes one governmental agency which says, work out your differences, make peace with the other industries, etc. In our country, as you know, with the separation of powers, executive branch, legislative branch, there isn't one government. To what degree does our form of government, not a parliamentary government, impede or prevent these kinds of participatory approaches in solving problems?

DR. OUCHI:

I think it imposes a greater burden on us in doing so. I think the advantages of that system are equally clear. We don't have the likelihood of a Tojo rising to power the way it happened in Japan. Clearly the burden is greater given our form of government.

We are beginning the study of Minneapolis and of Minnesota as part of this research project. I visited Minneapolis several times for various purposes and I have observed on my visits there that it seems to have a uniquely integrated community. The business community and the larger community seem to be able to take joint actions to solve their problems remarkably well. Minneapolis is anomalous, they have a 5 percent club and a 2 percent club. The major firms have committed themselves to donate 5 percent of their pre-tax earnings annually to local charities. Now in a supposedly narrow-mindedly self-interested profit-seeking economy, how do we explain this kind of behavior? Are these people crazy? Do they not have shareholders? Well, what they have is a broad network of institutions which create that memory; the memory remembers that you behaved in the generous responsible way in the past or that you did not behave that way in the past. One could observe that Minneapolis, in many ways, is more homogeneous than many other parts of the Midwest. One could also observe that it is, in many ways, very much representative of what we think of as being very central to our culture. It is, after all, a milling town. There's nothing high-tech about the milling of flour. Yet, it has very successfully transformed itself into an active center of micro-electronics in the last several years. It has maintained the vitality of the economy. I was at the Commerce Department the week before last and one of the people told me that they had done a study in 1971 of how ten cities of similar size in different regions of the country had handled their distribution of block grants. In all of the measures that they have applied, Minneapolis had come out No. 1. When they went there to find out why, their impression was that they had this institutional structure that permitted people to settle their differences reasonably well.

QUESTION:

In following up on that, Japan is a small country, not so varied as the United States. One could argue that the U.S. is just too big. In Japan those geographic areas talk to one another, they know one another, but many people in Minneapolis don't know many people in Florida and other parts of the country.

DR. OUCHI:

It's a point well taken but I guess I've always been skeptical of size arguments for the following reason. In business management, which is the field that I've studied most of my life, people have always observed that in a small company it is not easy, but relatively speaking, somewhat simpler to create an atmosphere of caring for employees, of participation, of integration, togetherness as a team. Yet Fortune Magazine had a survey a couple of months ago which asked business leaders in the U.S. which companies they felt are the best managed in the U.S. Two companies tied for No. 1 -- IBM and Hewlett-Packard. Both of them I would regard as being strong form Theory Z companies, both committed to lifetime employment, both having a very strong attitude of caring about their employees. IBM is not exactly small, about 46 billion dollars in sales.

QUESTION:

Well, first of all, every industry knows every one in the industry. It doesn't matter where they're located. Through things like the Business Roundtable the top people get to know all the people around, so I don't think the problem is size in this country. But we do have anti-trust laws and, it seems to me, in order to carry out the kind of program the Japanese follow there would have to be some institution like MITI that had the power to grant not only special tax incentives, but also to grant exemptions under the anti-trust laws for joint research projects. That would mean that there has to be some kind of legislation which in itself would represent a consensus and tend to offset the kind of thing where people would try to get a special deal from Congress. There would have to be a consensus that this is the way we're going to do it; the same as today there is a consensus on anti-trust legislation which is about as solid as anything can be next to the Constitution itself. Would you agree with that?

DR. OUCHI:

First of all, let me ask you. You say that the consensus on anti-trust is solid and that is that it should not be altered.

QUESTIONER:

Well, the basic concept is solid.

DR. OUCHI:

My view on this subject is that it clearly makes sense to have in place a legislative apparatus on anti-trust which restrains everybody equally. However, it is necessarily the case that for an industry that is undergoing rapid growth or an industry that has been undergoing decline, there is a need for the industry to reorganize. Typically the patterns of relationships between companies and suppliers ought to change; the number of players probably ought to change; there are several characteristics of the structure of the industry that ought to change. Within the restraints of anti-trust law, it is almost impossible for that kind of restructuring to occur in the U.S. In a sense what I see in the Japanese case is, the public has said to the government: we are prepared to permit you to temporarily lift up and suspend the anti-trust apparatus for a little while provided that you have some governmental body that watches them like a hawk so they don't cheat. As soon as they've gotten reorganized, back down comes the apparatus.

QUESTION:

Of course we've tried something like this in the '30s with the NRA, I don't know how familiar you are with it, and the Supreme Court threw it out because they said it violated the Sherman. So there would have to be that kind of temporary exemption but there would have to be a watchdog agency, too.

QUESTION:

You've done a great deal with managers,helping to show them how they might manage their business more effectively with what we learn from the Japanese. If you were sitting where we are, what would you try to do legislatively to help move this country to where it would be in a better position to compete with the Japanese on international markets?

DR. OUCHI:

I honestly don't have the answer to that question. I wish I had a specific remedy that I could suggest to you but I don't. All I can observe is that it seems to me that you cannot have a dialogue without some kind of an institutional structure that has clearly been approved and legitimated by our government. Conversation between firms and between industries is considered by most business people in this country to be, it may be something that you do, but it certainly isn't socially acceptable, you shouldn't talk about it. I think that it may not be necessary to have even more than the symbolic value of legislation but that symbolic commitment of the government to try to seek a different kind of relationship I think would be terribly important.

QUESTION:

Take a moment to talk about labor and labor unions in Japan, comparing them to the United States. You mentioned the unique difference in Japan and the U.S.

DR. OUCHI:

Japan at the moment has its labor force approximately 30 percent union-represented. In essence all of the non-farm companies of any size must be unionized. Therefore they are nearly twice the rate of union representation as we are. The big difference is that Japanese unions are characterized by being overwhelmingly enterprise unions or what used to be known in this country as "company unions." Company union came to be a bad word among labor unions in this country. In the U.S., of course, we have two forms of unions, the industrial union such as the UAW, the Teamsters, etc. and the craft guilds. It is my feeling that the craft guild structure of American unionism is inherently incompatible with contemporary industry. The problem is that you will on many occasions find as many as four or five separate unions within one industrial plant or facility. You will find as many as 17 separate unions in a railyard; as many as 19 separate unions in a shipyard. The leaders of each union are not elected for the purpose of surrendering jobs to other unions, and it therefore becomes impossible to contemplate any form of flexibility of the assignment of manpower across work lines and that is the essence of what it takes to have efficiency and productivity. What the solution is I don't know, but it would seem to me that we would be in a whole lot better shape if those craft unions had the capacity to bargain as a single unit within each facility so that they would have the capacity of some kind of flexibility across lines.

QUESTION:

While I think the problems that my colleagues have raised regarding the antitrust laws are very real ones, I think there are some people who would suggest that we have some institutions in place for allocating research that may reach different results than what the Japanese have reached. The problem is not just that we don't have the institutions but that the institution seems to reach results which are not as effective as the results the Japanese institutions reach in terms of industrial competitiveness. Would you care to comment on that?

DR. OUCHI:

I'm not so sure that we do have the institutions. I see, for example, mutual companies and stock companies and the insurance business taking separate positions.

How many Members of Congress are there who really are interested in becoming experts on FASB rules as they apply to the life insurance industry or actuarial science or anti-trust in the life insurance industry? But that's what you have to do if they can't come to you with a coordinated position. On the other hand, if you let them come together with a coordinated position you know it's going to be one that's going to do grievous damage to the securities industry, the banking industry, and everybody else. So you're back into the same cycle again. You've got to have in the end some arena in which all of the actors, each of whom is fully expected to be narrowly self-interested, but all of whom are now constrained into a setting in which there is going to be disclosure. Therefore, there is going to be some reasonable likelihood of agreement in the end, assuming that these are all reasonable people -- though self-interested -- looking at the same set of facts which they can ultimately agree upon. You enhance the likelihood of a reasonable position.

QUESTION:

It seems to me that what you're saying is another version of what you said in Theory Z. In Theory Z you said that a company whose management tries to coordinate a cacophony of demands and interests within the corporation with topdown regulation and decisionmaking, by fiat, is less efficient than a company that figures out how to get the best and most creative ideas from the various parts of the company and coordinate them into a unified whole, regularly harvest the ideas from within the company and make them work efficiently. And those corporations that have tried Theory Z, by whatever name, have found that that works. What you're saying is that managing a country ought to work the same way.

DR. OUCHI:

That's right. As you have correctly observed, I told you I was simple-minded and in fact all I have done is to do Theory Z all over again in a slightly different setting. Another way to express this is one that was expressed by the great economist, Von Hayek in 1945 in writing about freedom. He observed that it is necessarily the case in any organization, no matter how large, that each and every individual, no matter how humble his or her position, possesses some specialized information about how best to do their job which no one else knows. It is therefore necessarily the case that the organization can achieve full efficiency only by granting to each and every individual the freedom and discretion to make their own choices, thereby allowing them to make use of that local information. But there is a catch and the catch is, those entrusted with governance will never give that kind of discretion and freedom to those whom they govern unless they trust them. A plant manager won't give that freedom to the worker if he doesn't trust the worker. The Congress won't give it to the states if it doesn't trust them. To trust another person means essentially to understand that you have fundamentally underlying objectives which are, at least, reasonably in concert with one another. You can't know that if you don't have a sustained dialogue of some depth and some intimacy. You can't know that people's incentives to behave responsibly, therefore, to be trustworthy are proper unless they are at least partially captive within an institutional framework from which they cannot escape. If you want to see trustworthy behavior, look at the diamond merchants in New York who are largely of the Hasidic sect. They trust one another completely; exit from that group is nearly impossible. You don't have to worry that somebody else is going to cheat you; therefore the efficiency with which they can deal with one another is tremendous. If you didn't have some kind of stability in any of our institutions, if you don't have memory, then you don't have the capacity to trust one another. If you don't have the capacity to trust one another, nothing can work well.

QUESTION:

Could you elaborate a bit on how these industry groups or sector groups get together. I am struggling to visualize in my mind how insurance companies get together with the stocks and bonds people and all the competing groups that might possibly have an interest. You mentioned the widgit manufacturers worrying about imports from India. It's hard for me to imagine the arena in which that takes place and it's hard for me to imagine at some point the people who are dependent upon cheap imports, for example, wouldn't say, this is contrary to our interests to go along with your proposal even though we know it hurts you.

DR. OUCHI:

There are times indeed when they fail to reach agreement on important issues on which they ought to. Again, these are not different kinds of people than we have. I want to reinforce a point, let me give you an example. We often tend to think of the Japanese as being so different from Americans, Italians, British, French, Canadians. When we see the reality of Japan a little more closely and see that they're actually narrow-minded, selfish human beings, we say, gee, maybe they're changing.

At the Sony Corporation, all of the employees share in the normal profit-sharing bonus. None of the managers do. The co-founder and chairman of Sony understands that his managers actually make decisions that could influence the company's profits from one year to the next; he doesn't want them to have any incentives to think in terms as short as a year. The executives at Sony have their wages reviewed once every three years. Why? Because the chairman understands that his executives, like anybody's else's, are naturally inclined to be narrow-minded, shortsighted and selfish; therefore he has to create explicit incentives to cause them to take a longer view, a broader view, a less selfish view. There isn't any reason we can't construct some of those kinds of same incentives and constraints in the U.S. They've done it successfully at IBM, they've done it at Hewlett-Packard, they do it at companies like Kodak, Proctor & Gamble. We see it in many successful American companies. There isn't any reason it can't be more general.

QUESTION:

The '81 Tax Bill was somewhat similar to what you're saying. The only problem is that all of industry and business got together and they rolled the Congress. What could we have done? Is it an institutional problem that we have because we have the Senate and the House and the Administration all interested? We didn't seem to have the ability to cope with that kind of influence.

DR. OUCHI:

My guess is that if you saw the likelihood of that happening again, you'd find a way to get organized. And you have a much easier time doing it than they do. You're much better organized than they are now. If they get a little bit better organized, you're going to get a lot better organized, and you're going to end up with the capacity to actually carry on a dialogue. There are worse outcomes.

QUESTION:

Do the people in Japan get at all nervous about the close liaison between industry and government?

DR. OUCHI:

Yes, the press is completely irresponsible on the score and they're always attacking everybody for doing improper things.

QUESTION:

What kinds of checks and balances would you suggest aside from, or do they have aside from the press?

DR. OUCHI:

I discussed this issue with the New York Times business economics correspondent in Tokyo and with the chief of the Wall Street Journal bureau in Tokyo and I said to them the following: In all of these MITI discussion councils there are journalist members of the council. Clearly again you have a set of balanced incentives, you want to pick somebody who isn't seen as a "patsy" because it doesn't do you any good. You also aren't going to pick somebody who is wholly irresponsible. From the standpoint of the journalist who is invited into one of these discussion councils, you have strong incentives to report honestly as you think you should. On the other hand, you have very strong incentives not to be irresponsible because if you are irresponsible or seem irresponsible they will disinvite you from that council; your competitor from the other newspaper is going to get invited in your place, and your editor-in-chief is not going to be real happy about that. So again you have a nice set of balanced incentives.

You get a good deal of responsible behavior in which the journalist sits there on the inside of the tent rather than on the outside of the tent. He is supposed to bring his criticisms to the table and say, if you guys do that let me tell you how I think my readers are going to react. He doesn't always do that -- the better ones do -- others don't. He's not supposed to write anything until the policy discussion is finished and the position has been announced, then he is free to write anything he wants, any kind of criticism, any kind of whatever. He is not perfectly informed because there is a lot of talking that goes on in small rooms when he isn't there, but he's pretty well informed about what this is all about -- who wanted it, and why they wanted it, who's going to win from it, who's going to lose from it. He is able to provide very complete disclosure to the public and the public, as a consequence, feels pretty well informed.

QUESTION:

You mentioned one thing which was intriguing: about several years ago they decided priority was environmental issues. Why would a bunch of hungry, money-mongering companies come to the government and say, what we've got to put down is stronger environmental regulations. How did it happen?

DR. OUCHI:

Because there are environmental groups represented on these councils. The major labor federations are represented, also religious groups, mayors, etc.

QUESTION:

We know that you are very actively involved in talking to many corporations, many businesses large and small, and read about you in Business Week and many

different business journals. I just can't help but muse about what is going on in the labor end of things these days. I meet with my labor representatives back in my own district and it seems to me that many times they come to me with positions that are so very polarized and so stuck in concrete; however when I provide them with a broader spectrum or a broader vision of the total issues, then they are more receptive to saying, we didn't know that, maybe we should change or move or whatever. It seems to me that this is a prime time now when many industries are shutting down labor is (bells and sirens and beepers interfere!)
Secondly, the philosophical message is compromise rather than confrontation. I'm wondering if you are making any major efforts to address the National AFL-CIO conventions or if you talk to select groups of union members to help mold some of them and share with them some of your ideas.

DR. OUCHI:

I've been remiss on that score. The only time that I've spoken to any substantial group of labor leaders has been under the sponsorship of the Federal Mediation and Conciliation Service, which in Southern California has taken the initiative in trying to develop a dialogue between business and organized labor. Under their sponsorship I have participated in those kinds of discussions.

# # # # # # #

CIIT

Chemical Industry Institute of Toxicology
1982 ANNUAL REPORT

SCIENCE IN THE PUBLIC INTEREST

CIIT, the Chemical Industry Institute of Toxicology, was organized eight years ago to find answers to many of the questions that the public, the government, and the chemical industry were asking about the health effects of chemical compounds. Located in Research Triangle Park, N.C., a prospering research center a few miles away from three of the nation's leading universities, CIIT is a not-for-profit toxicological research institute supported by 33 chemical companies.

CIIT's mission is threefold:

- To seek new knowledge about the toxicity and mechanisms of toxicity of basic industrial chemicals through research and testing;
- To devise more rapid, economical, and predictive methods for detecting chemical toxicity;
- To train scientists in the discipline of toxicology.

Although created and financed by leading chemical companies, CIIT selects commodity chemicals for toxicological testing without regard to their importance to any member company, and specialty or proprietary compounds are not tested. Information gained from its research and testing programs is released to everyone without preference, thus assuring that CIIT's findings can be used rapidly in the research programs of others. CIIT does not promote an adversarial point of view.

By applying science's best tools to detect and predict why, how, and to what extent certain substances may be harmful to living organisms, CIIT has impact on the life of virtually every person on earth. The work of CIIT allows society to reap great benefit from the discovery and proper use of chemicals and chemical products.

CIIT is a practical expression of the sincere concern for public health and environmental well-being held by leaders of the chemical industry.

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CHAIRMAN'S MESSAGE

Industry around the world finds itself in a time of great stress. Our economic engines have slowed to the point there have been fundamental dislocations in many sectors. Many companies will never be the same, having had to respond by reducing costs, trimming employment, divesting facilities, and changing strategic directions.

Yet it is clear that in the face of all this turbulence, the public is not willing to give up the gains made in recent years toward making the world a more healthful place in which to work and live — nor should it. Thus, the public mandate which brought CIIT into existence still operates, and industry must respond to this as well as to the new economic situations. In a very real sense, CIIT is being tested just as much as are the corporate institutions which form it. The question is . . . does CIIT and the purpose it serves command the support of scarce resources from each member company involved?

So far, with a very few exceptions, the answer has been yes. The companies that form the backbone of the industry still rally to CIIT's support. We can see that the need for good science in the arena of chemical safety is as real as ever and that CIIT is making a unique contribution to develop it — one that could not be made easily in university or government laboratories or even in our own facilities. We are proud that there has been assembled in one place under our sponsorship a cadre of world class toxicological scientists tackling the fundamental questions about the biological fate of chemicals in living organisms. Through extrapolation of these data, CIIT is helping to determine what this may mean to human health and what it implies for sound regulations. CIIT is also devising shorter but more sophisticated means of making these measurements.

CIIT's progress in all these areas has been substantial and fully lives up to the expectations we had for it at the outset. We also should be proud that CIIT's management has responded to the critical environment we now face by volunteering to reduce budgets and expenses. Laboratory operations are taut and cost effective and morale is good.

However, we should appreciate that there is a critical mass below which CIIT can no longer function effectively — and we may be approaching it. Therefore, each member company representative should redouble his efforts to retain and strengthen his company's support for CIIT. The rest of us must be willing to help each other do this and to enlist the aid of our new participants. To do less than this risks the chance of losing what has been called by Dr. Joe W. Grisham, Chairman of the Department of Pathology at the University of North Carolina at Chapel Hill, "the jewel of the industry." My own personal belief and dedication is that CIIT will not only survive, but continue to develop and prosper. The alternative is unthinkable.

PRESIDENT'S MESSAGE: RESEARCH CHALLENGES OF THE 80'S

In the past the President's Message has usually described the current status of the Institute and the research accomplishments during the period preceding the message. This year I would like to identify some of the important research questions for which CIIT will attempt to find answers in the next decade. Clearly the number of important research questions in toxicology are so numerous that CIIT, because of its size, cannot hope to investigate all of them. We must be selective, choosing those areas of research which are most pertinent to potential toxic effects of commodity chemicals and, on the other hand, be consistent with the specialized scientific talent present at the Institute.

Understanding the mechanisms by which commodity chemicals may cause a wide variety of toxic effects in experimental animals will be the major thrust of research activities at CIIT in the next decade. Knowledge of the biological mechanisms of toxicity of chemicals is essential for the development of more economical, rapid and predictive assays for the potential of other compounds to cause the same toxic effects. Also, knowing the biological mechanisms of toxicity of a chemical in experimental animals we are better able, by way of studies using human tissues or studies in humans adventitiously exposed to the chemical in question, to predict the qualitative and quantitative aspects of the toxicity of that chemical to man. The biological mechanism of toxicity is known for only a few compounds. Past research at CIIT has been a major contributor to what knowledge there is about the biological mechanism of toxicity of chemicals (i.e., formaldehyde, dinitrotoluene, terephthalic acid). These studies on the biological mechanisms of toxicity of commodity chemicals will employ the techniques of cell biology, molecular biology, biochemistry, pharmacokinetics, metabolism and experimental pathology.

Cancer induced by commodity chemicals will continue to be a major area of research emphasis at CIIT. Particular emphasis will be on the mechanisms by which chemicals cause an increase in tumor incidence, on the development of less expensive, more rapid and more predictive techniques for detecting the potential for a chemical to cause cancer in man ("short-term" tests) and on the relevance of certain chemically induced tumors in rodents to the potential for that chemical to cause cancer in man.

Chemicals can cause cancer in animals in a variety of ways. However, carcinogenic chemicals can be conveniently classified into two categories, those which cause an increase in tumors by the irreversible process of "initiation" and those which cause an increase by the reversible process of "promotion." There is currently active consideration in the scientific community and federal regulatory agencies that "promoters" should be regulated less conservatively than "initiators." A major thrust of the CIIT research into chemically induced cancer in animals will be development and validation of techniques to determine whether a compound is increasing the incidence of tumors by an "initiating" or "promotional" mechanism.

The major direction of the "short-term" test research at CIIT for potential carcinogenic chemicals will be the development of techniques using live laboratory animals. We believe that data obtained using these techniques will be more relevant and more predictive of the potential of a chemical to cause cancer in man than the tests in bacteria, insects and animal cells in culture currently in use. This is because the techniques in live animals take into account distribution, metabolism and excretion of the compound and allows for repair of any precarcinogenic event that may occur; the same processes that will be operating in humans exposed to these chemicals.

There are some tumors induced by chemicals in rodents which may not occur in humans exposed to the same chemical. Among these are tumors of the rodent liver. CIIT will be carrying out research to better understand the comparative biology of liver tumors in mice and rats. With an increased understanding of the biological mechanism of spontaneous and chemically induced tumors of the liver in rodents, we will be in a better position to understand the relevance of these tumors to risk of cancer in man from exposure to these chemicals, especially as we extend these studies to human liver.

One of the major dilemmas in toxicology is uncertainty about the applicability of chemical toxicity data generated in laboratory animals to man. The only direct means of resolving this dilemma is to do comparative studies of the metabolism and biological effects of chemicals in humans and surrogate laboratory animals using human tissues obtained surgically or at autopsy or using blood or excretory products of humans industrially or accidentally exposed to the compound of interest. CIIT is currently doing such studies and will be conducting more of these kinds of comparative studies in the future. In this way we will be better able to assess the validity of our experimental animal models for predicting various toxic effects in humans.

The disciplines of reproductive toxicity and immunotoxicology will receive increased emphasis in the CIIT research program of this next decade. The knowledgeable scientific community has reservations about the predictability of our experimental animal models for reproductive toxicity in man. The future research program at CIIT will stress research aimed at understanding the mechanisms by which chemicals cause birth defects and reproductive defects in the commonly used experimental animal species. From these data, along with studies in human tissues, we may be in a position to determine how accurately our experimental animal models predict the potential of a chemical to cause reproductive toxicity in man at concentrations to which he may be exposed in the work place.

The emphasis of the research program in immunotoxicology will be on chemically induced allergic responses in man and on the effect of alteration of the immune system on the incidence of chemically induced cancer in experimental animals and man.

In this brief summary I have referred to some of the major areas of toxicological research that will occupy the scientists at CIIT for the next decade. The 1980's will be an exciting era of discovery for toxicology. I have no doubt that CIIT will emerge from this decade as a leader among research institutions working to provide answers to these important questions.

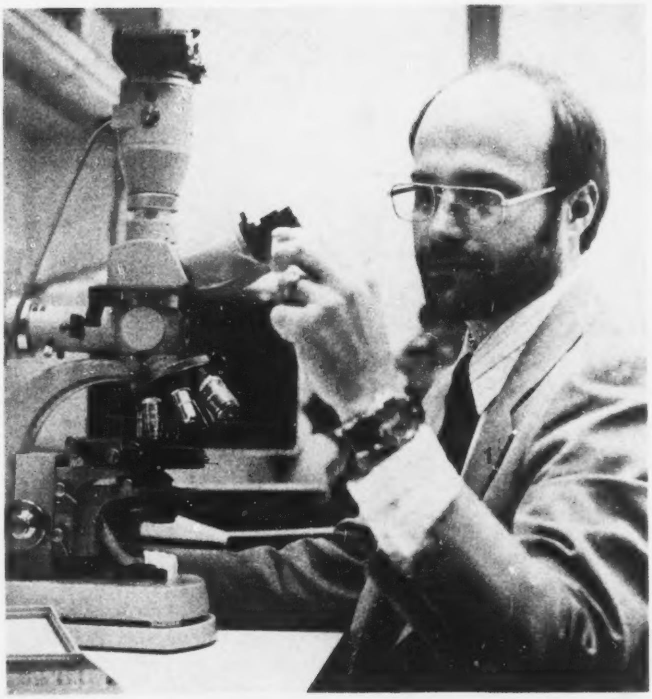
WORK OF THE INSTITUTE

CIIT is rapidly becoming a leader in the field of toxicology. Its outstanding scientific staff, sophisticated instrumentation and physical facilities, and innovative programs underscore the strong commitment of the chemical industry to science in the public interest.

Five scientific research specialties — general toxicology, biochemical toxicology, genetic toxicology, pathology, and epidemiology — work together at CIIT to discover how, why, and which chemicals may cause health problems in humans.

In 1982, the Institute's research and testing programs contributed substantially toward a better understanding of the ways in which exposure to basic industrial chemicals may lead to health concerns ranging from allergies to cancer to birth defects. Ten priority chemicals were selected for concentrated study, with special emphasis on these research objectives:

- Detecting the potential of a selected chemical for causing cancer (a carcinogen) or genetic abnormalities (a mutagen)
- Developing short-term, economical tests for identifying carcinogens and mutagens
- Determining safe levels of exposure for chemicals
- Conducting long-term animal tests, or bioassays, to learn about the effects of varying concentrations of a chemical over extended periods of time
- Studying how chemicals move through the bodies of laboratory animals in order to determine how they are absorbed, how they are used by body cells, where they accumulate, and how they are excreted
- Predicting human health risks through interpretation of animal studies
- Learning from the history of human exposure to chemicals by studying the health records of those exposed



Several programs of particular interest during 1982 are described on the following pages.

PREDICTING HUMAN HEALTH RISKS

The CIIT testing program is increasing the amount of information available to the toxicity of chemical compounds with "lifetime" studies using laboratory animals. However, information regarding what happens to animals during chemical exposure is not sufficient by itself to project realistic estimates of risks to humans from exposure. Meticulous research into the ways a toxic chemical behaves in the bodies of various species is also needed, along with the development of appropriate mathematical models for relating both types of data, before scientifically defensible decisions about acceptable levels of chemical exposure can be made.

Delivered Versus Administered Dose

Current governmental regulatory practice is to estimate risk exclusively in terms of data obtained from long-term testing studies. Particular mathematical models designed for use in predicting risks to humans are then "fit" to these data.

Such predictions generally assume that the amount of chemical delivered to specific sites in the body, such as nasal passages, lungs, or liver, is linearly proportional to the amount of chemical administered. Research findings regarding the biochemical processes that occur in the body of the exposed test animal currently play a limited role in this method of risk estimation.

For example, if 54% of the rats required to breathe 15 ppm of formaldehyde over a two-year period developed nasal cancer, the conclusion might be drawn that a similar proportion of mice -- or humans — would develop cancer under the same conditions. In fact, this is not the case, as CIIT's formaldehyde study revealed. Mice and rats respond differently to the presence of chemical irritants in the air they breathe. Understanding the reasons for such differences, and incorporating this information into predictions of human risk, are important parts of the safety evaluation process.

Since the dose delivered to target organs may be very different from the dose administered to the animal, detailed knowledge about the distribution and metabolism of chemical compounds in the whole animal is essential. This knowledge is the product of CIIT's research programs. Work at CIIT in risk assessment is focusing on the development of mathematical models that will permit findings from this type of research — in combination with data from testing studies — to be used to the fullest scientific advantage.

IDENTIFYING MUTAGENS AND CARCINOGENS

DNA is the basic genetic material of life. This fundamental nucleic acid is responsible for the normal replication of cells. Damage to DNA through exposure to mutagens, or chemical agents that affect the ability to make exact copies of itself, may result in serious health concerns such as cancer or genetic disease.

An objective of the genetic toxicology program at CIIT is the development of meaningful systems to evaluate effects caused by chemicals on the DNA of living animals. Such assays provide more and better information than assays using bacteria, which often do not reflect the complex patterns of uptake, metabolism, detoxification, and excretion that occur in whole animals or people.

Assaying DNA Damage and Repair

Already in place at the Institute is a DNA repair assay which indicates those cells in an animal whose DNA has been damaged by chemicals. Another assay developed at CIIT uses lymphocytes to assess chemically induced genetic changes in circulating blood cells. Where possible, direct comparisons between laboratory animals and humans are being made.

The ultimate goal of genetic toxicology is to determine which changes, if any, will occur at the molecular level in the DNA of humans as a result of chemical exposure. Such studies will require that the newest techniques for the study of DNA be applied to toxicology. This work has already begun at CIIT.

Cell Transformation Assays

"Initiators" are carcinogens that appear to act by causing a permanent mutation in the gene. "Promoters" are carcinogens that have the ability to stimulate tumor growth from cells that have already been initiated. CIIT has developed a cell culture assay in which cells, responding to chemical treatment, progress through the steps of initiation and promotion. This system allows researchers to observe these events at the cellular level during tumor development.

Because promoters have been shown to have safety thresholds and reversible effects, the use of chemicals that cause cell changes in one of these two ways can possibly be regulated differently by governmental agencies. Cell transformation research at CIIT is helping to provide information that will be useful in this area of regulatory decision-making.

LIVER TUMOR RESEARCH

Rodent liver tumors represent the greatest single endpoint in chemical safety evaluation, and are found in over 60% of long-term testing studies of animals exposed to chemicals that prove to be carcinogenic. Recent studies have shown clearly that liver cancer is a multistep process that includes both initiation and promotion.

Researchers in CIIT's pathology department have implemented a series of initiation-promotion studies in living animals designed to evaluate a chemical's ability to initiate or promote liver tumors. These protocols have demonstrated, for example, that the initiating activity in technical grade dinitrotoluene (tDNT) resides in the 2,6-DNT isomer, which comprises less than 20% of the technical grade mixture. (Both purified 2,6- and 2,4-DNT isomers have promoting activity.) The protocols are currently being used to investigate the development of liver cancer in rats exposed to di (2-ethylhexyl) phthalate.

Another important area in liver tumor research at CIIT is aimed at understanding the factors that control progression versus regression of cancerous and precancerous lesions. Such research may explain, for example, why only one tumor develops for every 400 suspected precancerous lesions that are present in livers after twelve weeks of exposure to tDNT.

Cell Specificity

Some cancer-causing chemicals have been found to "target" a specific cell type. For example, not all liver tumors originate in the liver cells themselves, but may arise from cells in the blood vessels of this organ. Knowledge about cell specificity in chemical liver cancer has been coupled with cell separation techniques at CIIT to examine the reasons why different chemicals induce varying types of liver tumors.

CIIT scientists have been able to show that various cell types differ in their ability to activate a chemical metabolically, to repair damaged DNA, and to undergo cell replication. A strong correlation between cancer and the inclination of a compound to attack a specific cell has been demonstrated.

CELLULAR RESPONSES

Many human health problems, such as leukemia, some types of anemia, solid tumors, immune deficiency diseases, and some skin diseases, result from disturbances in the cells. The immune system provides a powerful model for the study of chemical toxicity in animals and humans on the cellular level. CIIT's immunotoxicology program was expanded in 1982 to broaden current understanding of toxic chemical injury to the cell.

Study of White Blood Cells

Because of its pivotal role in initiating and directing the immune response, the lymphocyte — a type of white blood cell that is often a target cell for immunotoxic effects — is a valuable tool in the study of cellular response to chemical insult. The function of the lymphocyte has been extensively studied in both humans and rodents, and blood cells can be easily obtained for examination. CIIT immunotoxicologists are working to refine the use of the lymphocyte as a model for understanding cell growth and development.

Effects of Chlorinated Aliphatic Compounds on Skin and Immune System

Also underway at CIIT is the study of toxic reactions to chemicals such as TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin) and PCB's (polychlorinated biphenyls). Deterioration of the thymus gland and severe skin eruptions are characteristic responses to exposure to these compounds and appear to arise from an alteration in the processes regulating cell reproduction. These processes are being studied in epidermal cell lines and cells obtained from calf thymus.

REPRODUCTIVE TOXICOLOGY

Recent best estimates are that only 30% of all human conceptions in the population at large survive to birth. Enormous embryonic and early fetal losses of unexplained origin occur. However, other reproductive problems, ranging from infertility to birth defects, have been associated with chemical exposure.

Fertility

Considerable effort is underway at CIIT to measure human reproductive performance as it relates to occupational chemical exposure. CIIT's epidemiology department has developed a questionnaire that assesses adverse effects on fertility in both male and female chemical plant workers. The method has been validated by analysis of the medical records of plant employees who were exposed to dibromochloropropane. Not only was the questionnaire proved capable of detecting reduced fertility among workers, but the CIIT investigation revealed that the reduction in fertility could have been discovered years in advance of the actual discovery date.

Chemically Induced Birth Defects

The number of poorly defined factors responsible for abnormal mammalian embryonic development is overwhelming, and progress in explaining why birth defects happen has been slow. The need to simplify tests designed to determine the potential of a chemical to cause abnormalities, and to improve the predictive capabilities of such tests, is urgent.

Assays similar to test systems used in mutagenesis and carcinogenesis research, have shown promise. These assays measure the interruption of the process of biochemical exchange from cell to cell during embryonic

development, a factor that is thought to play a critical part in birth defects.

A chemical may affect embryonic cells from varying species and strains differently. This makes the simultaneous study of cells from different species — including humans — imperative. Investigations are in progress at CIIT to identify an appropriate human cell line for this purpose.

Studying Birth Defects in Living Animals

After studying a chemical that is suspected of causing abnormalities in culture, its effects must be validated in the living animal. Previous investigations at CIIT of the toxicity of methyl chloride, for example, have revealed heart defects in mice and a variety of adverse effects on organs, including the testes, following inhalation of very high concentrations. These findings have prompted the design of a multigeneration reproduction and fertility study spanning three generations of rats.

However, testing for chemical toxicity in the pregnant animal, which involves a highly complex biological system, has not greatly advanced knowledge of the reasons a chemical may lead to defects at birth. Whole embryo cultures or organ cultures of parts of laboratory animal embryos, on the other hand, offer possibilities for simplifying the study of the course of the developing abnormality.

One such method, initiated this year at CIIT, involves the culture of mouse embryo limb buds. The study of the developing limb allows new insights into the way chemical injury affects fundamental processes of reproduction.

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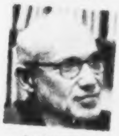
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David W. Doyle
Sr. Maintenance Technician

Ernest B. Hamilton
Sr. Maintenance Technician

Ronnie W. Smith
Sr. Maintenance Technician

Pascal L. Aprea
Maintenance Technician

R. Dwight McFarland
Maintenance Technician

Stanley D. Rose
Assistant Maintenance Technician

Linda S. Wallace
Security/Clerk Typist

COMPUTER SCIENCE

James D. Gerard, M.S.
Associate Scientist — Systems Analyst

W. Thomas Adams, B.S.
Sr. Research Assistant — Computer Programmer

EPIDEMIOLOGY

Richard J. Levine, M.D., M.P.H.
Department Head

Dragana A. Andjelkovich, M.D., M.P.H.
Sr. Scientist

Thomas B. Starr, Ph.D.
Scientist — Mathematician

R. Daniel DalCorso, M.S.P.H.
Research Associate

Patricia B. Blunden, B.S.P.H.
Sr. Research Assistant

Linda K. Shaw, B.A./B.A.
Research Assistant

GENETIC TOXICOLOGY

Byron E. Butterworth, Ph.D.
Department Head

Craig J. Boreiko, Ph.D.
Scientist

Andrew D. Kligerman, Ph.D.
Scientist

Thomas R. Skopek, Ph.D.
Scientist

Edilberto Bermudez, M.S.
Associate Scientist

James L. Wilmer, M.S.
Associate Scientist

Diane J. Abernethy, M.S.
Sr. Research Associate

Janet H. Frazelle, M.S.
Sr. Research Associate

Paula F. Allen, B.S.
Sr. Research Assistant

Gregory L. Erexson, B.A.
Sr. Research Assistant

L. Lynn Earle, B.S.
Research Assistant

Jennifer M. Fostel, B.S.
Research Assistant

Betty A. Honeycutt
Sr. Laboratory Assistant

INFORMATION SERVICES

Willanna A. Griffin, M.S.L.S.
Librarian

Marianne E. Daie, B.A.
Associate Librarian

PATHOLOGY

James A. Swenberg, D.V.M., Ph.D.
Department Head

Richard D. Irons, Ph.D.
Scientist

Kevin T. Morgan, B.V.S.C., Ph.D.
Scientist

James A. Popp, D.V.M., Ph.D.
Scientist

Joseph T. Martin
Sr. Research Associate

Kathryn C. Billings, B.S.
Research Assistant

Mary A. Bedell, B.A.
Research Associate

Elizabeth A. Gross, B.A.
Research Associate

Tanya M. McLaughlin, B.A.
Research Associate

Douglas A. Neptun, B.S., M.T.
Research Associate

Corrie N. Smith, B.S., M.T.
Research Associate

Wayne S. Stillman, B.S.
Research Associate

Linda K. Carter, B.S.
Research Assistant

Otis Lyght, H.T.
Research Assistant

Daniel L. Patterson, B.S.
Research Assistant

Holly W. Randall, H.T.
Research Assistant

Delorise H. Williams, A.A.S.
Research Assistant

Mary S. Morris
Sr. Laboratory Technician

PURCHASING

Charles M. Overton, B.S.
Purchasing Manager

Michelle B. Weaver
Purchasing/AP Clerk

Kaye S. Nagy
Receptionist/Switchboard Operator

QUALITY ASSURANCE

V. Irene Utterback, B.A.
Quality Assurance Officer

RADIATION & RESEARCH SAFETY

Garris D. Parker, Jr., M.M.Sc.
Manager, Safety & Environmental Control

Thomas R. Mangum
Sr. Environmental Control Technician

REPORT LITERATURE SPECIALIST

Robert O. Beauchamp, Jr., M.A.
Information Scientist

SECRETARIAL STAFF

Elizabeth W. Barnhill, B.S.
Administrative Assistant

Edna A. Mangum
Administrative Assistant

Marsena E. Taylor
Administrative Assistant

TOXICOLOGY

Thomas E. Hamm, Jr., D.V.M., Ph.D.
Department Head

Jack H. Dean, Ph.D.
Sr. Scientist

Frank Welsch, D.V.M.
Sr. Scientist

Craig S. Barrow, Ph.D.
Scientist

Lloyd D. Lauer, M.S.
Sr. Research Associate

William H. Steinhagen
Sr. Research Associate

Lorrene A. Buckley, M.S.
Research Associate

Ann E. McCarthy, B.S.
Project Record Coordinator

Janice K. Davis, B.A.
Research Assistant

Mark C. Phelps, A.A.S.
Research Associate

Timothy H. Raynor, B.S.
Research Associate

J. Michael Sherrill, M.S.
Research Associate

Donald B. Stedman, B.S.
Research Assistant

Richard A. James, Jr., B.S.
Sr. Laboratory Technician

C. Dean Auman
Laboratory Technician

Stephen W. Dennis
Laboratory Technician

Ellis L. Allen, Jr.
Sr. Laboratory Assistant

Walter C. Greene
Sr. Laboratory Assistant

Gary T. Jones
Sr. Laboratory Assistant

Sheilah M. McKinney
Laboratory Assistant

Carl U. Parkinson, Jr.
Laboratory Assistant

SCIENTIFIC ADVISORY PANEL

The Scientific Advisory Panel reviews and evaluates CIIT's proposed, ongoing, and completed research and testing programs. Its expert members represent scientists from industry, government, and academia.

Chairman: Dr. Joe W. Grisham
Professor and Chairman
Department of Pathology
University of North Carolina at Chapel Hill

Members: Dr. Yves Alarie
Professor and Chairman
Department of Industrial Environmental Health Sciences
University of Pittsburgh

*Dr. J. George Bekesi
Professor, Department of Neoplastic Diseases, and Head, Environmental Immunology Laboratory
The Mount Sinai Medical Center

Dr. Michael R. Boyd
Chief, Laboratory of Experimental Therapeutics and Metabolism
Developmental Therapeutics Program
Division of Cancer Treatment
National Cancer Institute

Dr. Joseph G. Brewen, Jr.
Director, Genetic Toxicology
Corporate Medical Affairs
Allied Corporation

Dr. Jerry LR Chandler
Senior Scientific Advisor
Division of Criteria Documentation and Standards
National Institute for Occupational Safety and Health

Dr. Kurt M. Dubowski
Professor of Medicine
Director of Toxicology Laboratory
The University of Oklahoma

Dr. Ronald W. Estabrook
Virginia Lazenby O'Hara Professor
Chairman of Biochemistry
The University of Texas Health Science Center at Dallas

Dr. Hans L. Falk
Associate Director of Health Hazard Assessment
National Institute of Environmental Health Sciences

Dr. Seymour L. Friess
Consultant in Toxicology
Drill, Friess, Hays, Loomis and Shaffer, Inc.

*Dr. J. Justin McCormick
Professor, Microbiology and Public Health and Biochemistry
Co-Director, Carcinogenesis Laboratory
Michigan State University

Dr. John A. Moore
Deputy Director
National Toxicology Program
National Institute of Environmental Health Sciences

Dr. Norbert P. Page
Senior Toxicology Advisor
National Library of Medicine
National Institutes of Health

Dr. Henry C. Pitot, III
Director, McArdle Laboratory for Cancer Research
University of Wisconsin

Dr. Charles F. Reinhardt
Director
Haskell Laboratory for Toxicology and Industrial Medicine
E.I. du Pont de Nemours & Co., Inc.

Dr. Robert A. Scala
Senior Scientific Advisor
Research and Environmental Health Division
Exxon Corporation

Dr. Donald E. Stevenson
Director, Toxicology Research
Shell Development Company

Dr. H. Michael D. Utidjian
Corporate Medical Director
American Cyanamid Company

Dr. I. Bernard Weinstein
Professor
College of Physicians and Surgeons of Columbia University
Institute of Cancer Research

*Outside observers

INFORMATION AND TECHNOLOGY TRANSFER

CIIT actively promotes public, governmental, and industrial access to information about the potential hazards of chemicals.

Local participation by CIIT staff scientists in teaching programs at nearby universities, governmental agencies, and industrial research and development centers benefit both students and practicing scientists. A regular seminar program features work completed at CIIT as well as work presented by invited speakers. Staff members also participate in national and international scientific meetings.

CIIT's annual Scientific Evening is an event designed to encourage the informal exchange of ideas and information among CIIT scientists, visiting scientists, representatives of the chemical industry and of governmental agencies, and the interested public. Poster and slide presentations help to describe the work underway at the Institute. This year's Scientific Evening was held September 7, 1982.

The Fifth CIIT Conference on Toxicology: Toxicity of Nitroaromatic Compounds, held January 28-29 in Raleigh, brought together investigators from around the world to share research findings about nitroaromatics and to survey health problems associated with exposure to these compounds.

Published proceedings of CIIT's six conferences to date ensure the communication of toxicological information about chemicals of public concern. A number of workshops and symposia are planned for 1983 as CIIT continues its commitment to information and technology transfer in toxicology.

TRAINING TOXICOLOGISTS

CIIT trains toxicologists to meet the challenges of a future increasingly complicated by new and exciting chemical developments. The Institute's top-flight scientific staff, state-of-the-art laboratory facilities, and multidisciplinary organization are special resources that make CIIT's post- and predoctoral training programs an invaluable experience for new toxicologists.

The postdoctoral program provides advanced research training for a maximum of 20 fellows at any given time. Trainees are selected from outstanding applicants who have recently completed doctoral degrees in biological or physical sciences.

Under the direction of a senior staff scientist, new fellows outline a plan of research which will advance CIIT's research and testing programs. Postdoctoral research contributes directly to CIIT's research objectives. During the two years of study at the Institute, fellows learn to apply the interdisciplinary and collaborative techniques of toxicology to their individual research projects.

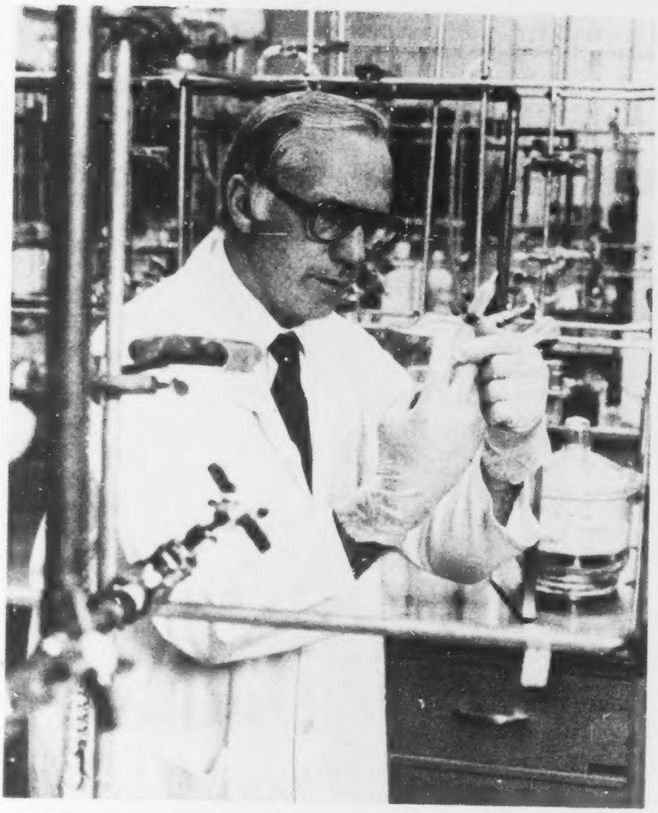
Postdoctoral fellows participate in formal and informal training activities at CIIT, including in-house seminars and minicourses, the yearly Scientific Evening, meetings of the Scientific Advisory Panel, and national scientific meetings related to toxicology.

A predoctoral training program has been arranged with selected universities to support the Ph.D. thesis of students showing promise of high-quality toxicology research. Predoctoral awards generally cover the last two years of university study. Research may be conducted either in the university laboratories or at CIIT with a CIIT staff scientist serving as academic advisor.

Predoctoral appointments made during 1982: Karen E. Beliles, University of North Carolina at Chapel Hill; Laurie Hudson, Harvard University; and Charles Richardson, Duke University.

1982 Postdoctoral Fellows (left to right): Dr. Maria Cheng, University of Pittsburgh; Dr. Edward C. Ward, III, Duke University; Dr. Russell D. White, University of Arizona; Dr. Joseph Donald deBethizy, Utah State University; Dr. Philmore Robertson, Jr., University of North Carolina; Dr. Peter K. Working, University of California — Davis; Dr. Raymond M. David, University of Louisville (Kentucky); Dr. Morrow B. Thompson, Michigan State University; Dr. Michael J. Murray, University of California — Davis; Dr. Michael McNulty, West Virginia University Medical Center; Dr. Tadashi Sawahata, Tokyo College of Pharmacy and Vanderbilt University; Dr. Charles Lindamood, III, West Virginia University Medical Center; Dr. Martin C. Dyroff, Vanderbilt University; Dr. Gregory L. Kedderis, Northwestern University; Dr. Bruce Hugh Dorman, University of North Carolina; and Dr. David James Doolittle, Michigan State University.

Not pictured are Dr. Robin S. Goldstein, Michigan State University, and Dr. Nancy A. Monteiro-Riviere, Purdue University.



1983 CIIT FOUNDERS' AWARD

Dr. Perry J. Gehring, Vice President of Agricultural Chemicals, Research, and Director of Health and Environmental Sciences, USA, at Dow Chemical USA, is the recipient of the 1983 CIIT Founders' Award for outstanding achievements in the field of toxicology.

This productive scientist has made substantial and continued contributions in the area of toxicological mechanisms. His work has been both general and specific, adding to current understanding of the way toxic chemicals act on the blood, liver, kidney, eye, and other target organs.

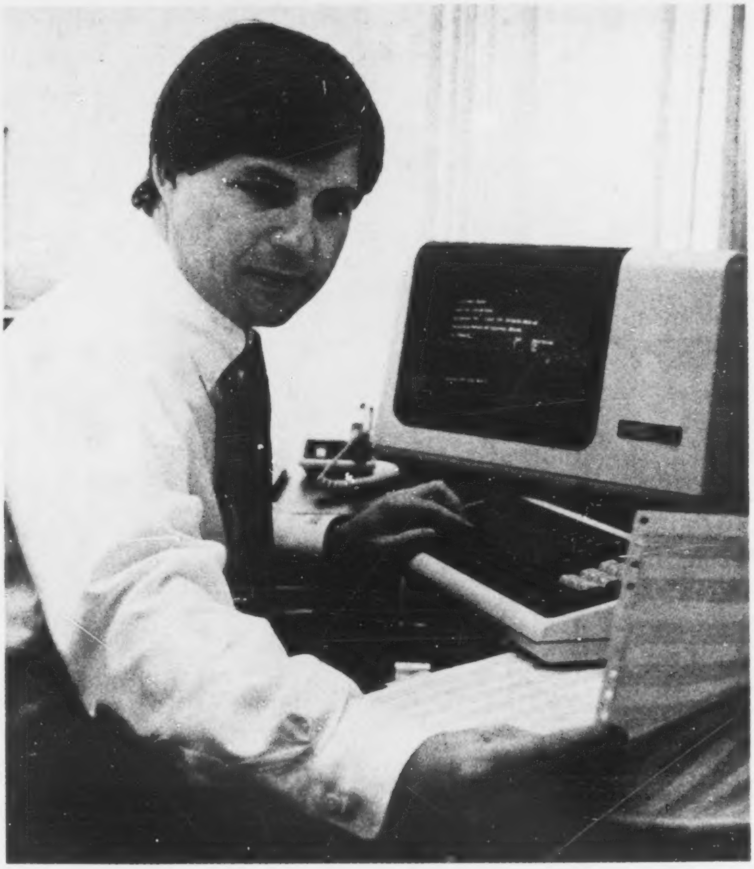
Most importantly, Dr. Gehring's studies of chemical pharmacokinetics in relation to chemical toxicity have provided valuable information concerning the extrapolation of toxic effects from high dose observations in the laboratory to real world low doses. His experiments with rats exposed to vinyl chloride showed that linear extrapolation procedures for risk assessment are not sufficient alone to determine potential human health effects caused by chemical exposure.

Dr. Gehring found that the metabolic activation of vinyl chloride to a carcinogenic metabolite proceeded in accordance with Michaelis-Menten kinetics. Thus he showed that the rate of production of the active metabolite responsible for tumor production was regulated to an upper limit. When the incidence of tumors in rats was plotted against the amount of active metabolite actually delivered to the target site, a proper dose-response relationship, linear in the low dose region, was found. Consequently, the estimated risk for rats associated with low doses fit well with the known tumor incidence caused by corresponding exposures of vinyl chloride in man. The dose of an active compound actually delivered at the site of chemical effect within the body must therefore always be considered.

The concept of the "delivered dose" strengthens toxicology as a predictive science, and has important implications for regulatory and risk assessment decision-making.

Previous Recipients of the CIIT Founders' Award

1978	Drs. Elizabeth C. Miller and James A. Miller
1979	Drs. Evan C. Horning and Marjorie C. Horning
1980	Dr. Irwin Fridovich
1981	Dr. Roswell Knight Boutwell
1982	Dr. Charles Heidelberger



THREE-YEAR FINANCIAL PLAN

	1983	1984	1985
	$ (Thousands)	$ (Thousands)	$ (Thousands)
Salaries and Benefits	$4,138	$4,345	$ 4,696
Operating Expenses	2,778	2,816	3,003
Education and Information	577	525	567
Research Programs	1,255	1,100	1,244
Capital Expenditures	693	596	642
Total Budget Before Contingency	9,441	9,382	10,152
Contingency	250	250	250
Total Budget	$9,691	$9,632	$10,402
Required Reserve Funds (25% of Total Budget)	$2,423	$2,408	$ 2,601
Depreciation	$1,419	$1,459	$ 1,500

Deloitte
Haskins+Sells

AUDITORS' OPINION

To the Board of Directors,
Chemical Industry Institute of Toxicology

We have examined the balance sheets of the Chemical Industry Institute of Toxicology as of December 31, 1982 and 1981 and the related statements of revenues and expenses and changes in fund balance and of changes in financial position for the years then ended. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the financial statements referred to above present fairly the financial position of the Chemical Industry Institute of Toxicology at December 31, 1982 and 1981 and the results of its operations and the changes in its financial position for the years then ended, in conformity with generally accepted accounting principles applied on a consistent basis.

Deloitte Haskins + Sells

Raleigh, North Carolina
February 4, 1983

CHEMICAL INDUSTRY INSTITUTE OF TOXICOLOGY

BALANCE SHEETS
DECEMBER 31, 1982 and 1981

ASSETS

See Note		1982	1981
	CURRENT ASSETS:		
	Cash	$ 57,409	$ 66,158
	Short-Term Certificates of Deposit and Commercial Paper	6,257,754	6,821,649
	Accrued Interest Receivable	73,264	180,510
2	Expense Assessments Receivable	419,129	—
	Prepaid Expenses	44,750	44,566
	TOTAL CURRENT ASSETS	6,852,306	7,112,883
3,4	Land, Equipment and Building, Net	11,263,991	11,867,108
5	Deferred Compensation Investments	704,177	530,529
	TOTAL ASSETS	$18,820,474	$19,510,520

LIABILITIES AND FUND BALANCE

See Note		1982	1981
	CURRENT LIABILITIES:		
	Accounts Payable	$ 276,803	$ 386,096
	Research Contracts Payable	408,860	154,095
4	Current Portion of Mortgage Loan	92,619	84,929
6	Current Portion of Pension Liability	2,577	7,835
	Construction Retainage	19,198	19,698
2	Deferred Funding	—	251,717
	Advance Membership Dues	427,154	341,293
	TOTAL CURRENT LIABILITIES	1,227,211	1,245,663
4	Mortgage Loan	10,634,280	10,726,900
5	Deferred Compensation Liability	704,177	530,529
6	Pension Liability	270,971	159,065
	Fund Balance	5,983,835	6,848,363
	TOTAL LIABILITIES AND FUND BALANCE	$18,820,474	$19,510,520

See notes to financial statements.

CHEMICAL INDUSTRY INSTITUTE OF TOXICOLOGY

STATEMENTS OF REVENUES AND EXPENSES AND CHANGES IN FUND BALANCE FOR THE YEARS ENDED DECEMBER 31, 1982 and 1981

See Note		1982	1981
	REVENUES:		
2,4	Operating Expense Assessments:		
	Membership	$ 8,845,627	$ 8,948,196
	Other Funding	252,544	—
	Interest From Investments	850,135	1,042,459
	Other Revenue	33,180	12,500
	TOTAL REVENUES	9,981,486	10,003,155
	EXPENSES:		
	Salaries	2,974,160	2,632,530
6	Employee Benefits	819,469	690,884
	Research Laboratory Supplies	924,523	904,420
	Research Contracts	1,460,408	721,314
	Interest on Mortgage Loan	937,295	944,348
3	Depreciation	1,333,421	1,257,502
	Occupancy Expenses	999,587	817,460
	Professional Fees and Contract Services	263,485	304,620
	Awards and Grants	430,208	321,088
	Professional Development and Travel	196,731	160,741
	Technical Information	101,657	115,928
	Recruiting and Relocation	89,843	62,946
	General Expenses	315,227	213,525
	Building Start-Up and Long Range Planning	—	189,767
	TOTAL EXPENSES	$10,846,014	$ 9,337,073
	EXCESS (DEFICIENCY) OF REVENUES OVER EXPENSES	(864,528)	666,082
	FUND BALANCE, BEGINNING OF YEAR	6,848,363	6,182,281
	FUND BALANCE, END OF YEAR	$ 5,983,835	$ 6,848,363

See notes to financial statements.

CHEMICAL INDUSTRY INSTITUTE OF TOXICOLOGY

STATEMENTS OF CHANGES IN FINANCIAL POSITION
FOR THE YEARS ENDED DECEMBER 31, 1982 and 1981

	1982	1981
SOURCES OF FUNDS:		
Excess (Deficiency) of Revenues Over Expenses	$ (864,528)	$ 666,082
Expenses Not Requiring Current Outlay of Working Capital:		
Depreciation	1,333,421	1,257,502
Pension	103,800	103,800
Increase in Long-Term Pension Liability	8,106	—
Increase in Deferred Compensation Liability	173,648	26,866
TOTAL SOURCES OF FUNDS	754,447	2,054,250
APPLICATION OF FUNDS:		
Acquisition of Property and Equipment	730,304	744,475
Decrease in Long-Term Mortgage Loan	92,620	84,928
Increase in Deferred Compensation Investments	173,648	26,866
Decrease in Long-Term Pension Liability	—	7,835
TOTAL APPLICATION OF FUNDS	996,572	864,104
INCREASE (DECREASE) IN WORKING CAPITAL	$ (242,125)	$1,190,146
CHANGES IN WORKING CAPITAL WERE REPRESENTED BY:		
INCREASE (DECREASE) IN CURRENT ASSETS:		
Cash	$ (8,749)	$ 7,685
Short-Term Certificates of Deposit and Commercial Paper	(563,895)	1,293,625
Accrued Interest Receivable	(107,246)	69,926
Expense Assessments Receivable	419,129	(18,389)
Prepaid Expenses	184	(570)
	(260,577)	1,352,277
(INCREASE) DECREASE IN CURRENT LIABILITIES:		
Accounts Payable	109,293	(131,328)
Research Contracts Payable	(254,765)	74,336
Current Portion of Mortgage Loan	(7,690)	(7,052)
Current Portion of Pension Liability	5,258	65
Construction Retainage	500	—
Deferred Funding	251,717	—
Advance Membership Dues	(85,861)	(98,152)
	18,452	(162,131)
INCREASE (DECREASE) IN WORKING CAPITAL	$ (242,125)	$1,190,146

See notes to financial statements.

CHEMICAL INDUSTRY INSTITUTE OF TOXICOLOGY
NOTES TO FINANCIAL STATEMENTS

1. GENERAL

The Chemical Industry Institute of Toxicology (CIIT) is an independent, not-for-profit corporation dedicated to the scientific objective study of toxicological problems from the manufacture, handling, use, and disposal of commodity chemicals.

CIIT is exempt from federal and state income taxes. Research materials are expensed when purchased. See Note 3 with respect to depreciation policies and Note 6 regarding the pension plan.

2. OPERATING EXPENSE ASSESSMENTS

Membership

There are three classes of CIIT members (A, B, and C). The class is determined by the net chemical sales, as defined, of the member and is the underlying basis for the membership dues commitment and voting rights.

Membership dues commitments are based upon a percentage of the member company's sales, as defined (A - .08%, B - .06%, and C - .04%), subject to provisions that the three-year commitment of any Class A company is not to exceed $2,400,000, unless such commitment would be less than .04% of sales, and the minimum three-year commitment by any member company is not to be less than $100,000. See Note 4 regarding assignment of membership dues as collateral for mortgage loan.

A revised method of computing membership dues commitment has been adopted by the Board of Directors to be effective January 1, 1983. Under the revised method there are only two classes of members (A and B); however, the class is still determined by the net chemical sales, as defined, of the member and is the underlying basis for membership dues commitment and voting rights. While sales remain the underlying basis for membership dues commitment, the method by which such sales are used in the computation of the commitment has changed.

Sponsorship

The Sponsorship Category consists of four classes of sponsors (Individuals, Chemical Manufacturers, Associations, and Chemical Users) which have the same rights, privileges and obligations of members, except the right to vote.

The sponsorship dues commitments are based upon defined parameters as set by the Board of Directors and shall be for a minimum period of three years.

Other Funding

CIIT conducts research programs for methyl chloride and terephthalic acid which are funded by interested organizations. Amounts funded by these organizations for such research programs will approximate the cost of the studies, and are recognized as revenues as the related costs are incurred. At December 31, 1982 and 1981, approximately $1,243,000 had been billed by CIIT to the funding organizations for such projects. The excess of billings over the project costs at December 31, 1981 of $251,717 has been included in deferred funding in the accompanying balance sheets. At December 31, 1982 both programs were substantially complete and all revenue and costs have been recognized.

3. LAND, EQUIPMENT AND BUILDING

A summary of land, equipment and building for the years ended December 31, 1982 and 1981 follows:

	Cost	Accumulated Depreciation	Cost less Accumulated Depreciation
December 31, 1982:			
Land	$ 421,725	—	$ 421,725
Equipment	5,787,225	$3,016,392	2,770,833
Building	9,489,089	1,417,656	8,071,433
Total	$15,698,039	$4,434,048	$11,263,991
December 31, 1981:			
Land	$ 421,725	—	$ 421,725
Equipment	5,205,826	$2,094,118	3,111,708
Building	9,340,184	1,006,509	8,333,675
Total	$14,967,735	$3,100,627	$11,867,108

Depreciation is computed on the straightline method using estimated useful lives as follows: building and structural components, principally 30 years; and equipment 5 to 10 years. Maintenance and repairs are expensed as incurred.

4. MORTGAGE LOAN

A mortgage loan dated May 3, 1979 exists with a financial institution bearing an interest rate of 8.7%, is collateralized by facilities, equipment, and assignment of dues payable to CIIT by its members, and is payable in equal monthly payments of $85,185, including interest, with a remaining 15% of the loan payable at the end of the thirty-year term. All restrictions and covenants of the mortgage loan agreement have been complied with for the year ended December 31, 1982. The total amount of principal repayments for the next five years at December 31, 1982 are as follows:

1983	$ 93,000
1984	$101,000
1985	$110,000
1936	$120,000
1987	$131,000

5. DEFERRED COMPENSATION

CIIT has deferred compensation agreements with a former officer and its general counsel. Under the terms of these agreements, portions of their compensation have been deferred with the funds being invested in long-term securities. While the investment suggestions of the individuals have been followed, principal and income cannot be withdrawn by the individuals until such time and under terms as specified in the agreements. The investments made under these agreements are assets of CIIT, and CIIT is only under an unsecured contractual obligation to make payments from the deferred compensation accounts. During 1980 payments to the former officer, as specified in the agreement, began and will continue for approximately 10 years.

6. EMPLOYEE BENEFITS

Under an employee investment/savings plan, CIIT contributes 50 cents to the plan for each dollar invested by employees, subject to the condition that CIIT's total annual contribution on behalf of any individual employee will not exceed three percent of the employee's earnings. Contributions to the plan by CIIT for the years ended December 31, 1982 and 1981 totalled $52,959 and $50,370, respectively.

A non-contributory defined benefit pension plan covers substantially all full-time employees. The plan provides that CIIT shall contribute to the pension fund actuarially determined amounts to fund retirement income benefits under the plan in accordance with the Employee Retirement Income Security Act of 1974. It is CIIT's policy to fund the plan annually based upon actuarial computations as of January 1 of each year. As of December 31, 1982 there were no unfunded vested benefits. Total pension expense for the years ended December 31, 1982 and 1981 was $259,154 and $206,123, respectively. Accumulated plan benefits and plan net assets at January 1, 1982 and 1981 were as follows:

Actuarial present value of accumulated plan benefits:

	1982	1981
Vested	$137,404	$ 35,006
Nonvested	155,874	145,617
	$293,278	$180,623
Net assets available for benefits	$606,887	$352,092

The assumed interest rate used in determination of actuarial present value of accumulated plan benefits was 6%

An employment agreement with a former officer of the Institute provides retirement benefits for life. The present value of these benefits was expensed over the term of the employment agreement based upon life expectancy. The accrued present value of these benefits at December 31, 1982 and 1981 of $65,948 and $63,100, respectively, has been included in the accompanying balance sheets as pension liability.

Effective January 1, 1981 CIIT implemented a supplemental executive retirement plan covering officers of the Institute as named by the Board of Directors. The present value of these benefits will be expensed over the participants' future employment periods. Expense accrued for the years ended December 31, 1982 and 1981 was $103,800 and $103,800, respectively, and is included in pension liability in the accompanying balance sheet. The benefits will be funded after retirement of the participants based upon plan provisions.

7. COMMITMENTS

At December 31, 1982, CIIT has authorized an outside agency to perform research under contract requiring payments approximating $230,000, principally through 1983.

8. LITIGATION

As of December 31, 1982 CIIT had two legal proceedings pending. One proceeding involves action commenced by an individual against sixteen defendants, including CIIT, to recover damages for injuries allegedly sustained by exposure to an unspecified chemical in the course of his employment in the printing industry. CIIT and Counsel considers its involvement as a defendant without merit and has requested the Court to dismiss the complaint against it. The defense of this litigation has been turned over to CIIT's insurance carrier who has accepted coverage.

The second proceeding, in which CIIT appears as a plaintiff, involves claims in the amount of $1,193,000 against the general contractor of the Institute's existing facility. The claim alleges the general contractor breached its performance contract which resulted in monetary damages to CIIT. On January 8, 1982 the general contractor entered a counterclaim alleging indebtedness of CIIT in the amount of $97,900 and damages in the amount of $500,000. While CIIT and Counsel expects to be successful in its claim it is impossible to estimate a recovery amount and therefore no related amounts have been recorded

CIIT SUPPORTING COMPANIES

Air Products and Chemicals, Inc.
Allied Corporation
Amoco Chemicals Corporation
ARCO Chemical Company
Bristol-Myers Company
Celanese Corporation
Diamond Shamrock Corporation
The Dow Chemical Company
E.I. du Pont de Nemours & Co., Inc.
Eastman Kodak Company
Ethyl Corporation
Exxon Chemical Company
GAF Corporation
General Electric Corporation
W.R. Grace & Co.
ICI Americas Inc.
The Lubrizol Corporation
Mobil Research and Development Corporation
Monsanto Company
National Distillers and Chemical Corporation Divisions, U.S. Industrial Chemicals Co. and Emery Industries, Inc.
Northern Petrochemical Company
Occidental Chemical Corporation
Olin Corporation
Phillips Chemical Company
Polysar Incorporated
PPG Industries, Inc.
Rohm and Haas Company
Shell Chemical Company (a division of Shell Oil Company)
The Standard Oil Company (Ohio)
Stauffer Chemical Company
Texaco Inc.
Union Carbide Corporation
Velsicol Chemical Corporation

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[illegible]

Department of Justice
Washington, D.C. 20530

JUN 7 1976

Milton R. Wessel, Esquire
Suite 3720
45 Rockefeller Plaza
New York, New York 10020

Dear Mr. Wessel:

This responds to your September 5, 1975, letter requesting a business review letter pursuant to the Business Review Procedure of the Department (28 CFR 50.6) with respect to the formation and proposed activities of the Chemical Industry Institute of Toxicology (CIIT).

You have advised that the CIIT is an industry sponsored, organized and supported organization formed for the purpose of acquiring, evaluating and disseminating and encouraging the acquisition, evaluation and dissemination of information regarding the potential toxic hazards of chemicals. The present members of the CIIT, we understand, are the leading members of the chemical industry. We further understand from your bylaws and other papers submitted that membership is open to any company engaged in the chemical industry for profit. We have also noted that the bylaws provide that the affairs of the Institute shall be managed by or be under the direction of the board of directors and that the directors need not be employees of a member of the Institute.

We have also noted the principle set forth in the bylaws that all research results and other data be published or otherwise be made public when evaluated and ready for disclosure and such results shall be available to all on a reasonable basis. We have also observed Policy Guidelines Statement No. 1, Disclosure, (adopted August 15, 1975) in which this general statement is expanded on. It is noted that the Institute proposes to publish the results of its research work to the public at appropriate times to the fullest extent appropriate. From these various policy statements we understand that the information which will be published by the Institute on the results of its own research or research conducted as its behest will be made available to the public and that Institute members will not receive information beyond that received by the public and other members of the chemical industry not members of CIIT.

In view of the fact that the joining together of the members of the chemical industry to form the Chemical Industry Institute of Toxicology is for the sole purpose of promoting and conducting research and training in the field of toxicology, with the results of such research being made available to the public and with such association under the management of a board of directors which is not limited to employees of members of the Institute, the Department does not intend to take any criminal action on this matter. This is without prejudice to the Department's right to proceed should it be determined that the CIIT is being used in any manner to accomplish an unreasonable restraint of trade. In accordance with paragraph 8 of the enclosed Business Review Procedure (28 CFR 50.6) this letter states only the present enforcement intentions of the Division as of the date hereof.

Sincerely yours,

Thomas E. Kauper

THOMAS E. KAUPER
Assistant Attorney General
Antitrust Division

(c) Existing Programs--Allocation of Proceeds. Any monies collected from a shareholder admitted to an existing Technology Program pursuant to subsection (b) shall be used in that Technology Program for the benefit of the then current participants in a manner as a majority of those participants elect.

(d) Existing Programs--Additional Shareholders. Any firm or entity seeking to become an Additional Shareholder (Section 9) shall be allowed to participate in an existing Technology Program only if such firm or entity also meets all of the requirements of subsection (b) above. If such firm or entity fails to meet such requirements, the Board of Directors shall not allow it to become an Additional Shareholder, unless it becomes a participant in at least one (1) other Technology Program.

Section 57. Termination of Technology Programs. A request to terminate a Technology Program may be made at any time by: (a) a participant; (b) the Chief Executive Officer; (c) the Board of Directors; or (d) the Technical Advisory Board. Such request, if approved by three-fourths of the Technology Program's participants, shall be submitted to the CEO. The CEO shall prepare a written report to the Board of Directors, recommending acceptance or rejection of the request to terminate. A two-thirds majority of the Board of Directors may choose to approve such request and terminate the Technology Program. If terminated, the participants shall be liable for all costs of terminating the Technology Program, including outstanding obligations to vendors, licensors, licensees, employees, and other third parties. If the request is not so approved by the Board of Directors, the Technology Program shall not be terminated; however, any participant(s) shall thereupon be permitted to withdraw from participation in the Technology Program. The withdrawing participant shall have those rights contained in Section 63 with respect to such Technology Program.

Section 58. Rights to Technology. The rights of a shareholder under technology developed and/or acquired by MCC for a particular Technology Program shall be governed by the terms of the Research and Development Agreement which relates to that Technology Program. Such Research and Development Agreement shall, however, contain provisions consistent with the following general principles:

(a) To the extent MCC needs rights under existing technology to perform it's activities, it may acquire such rights;

(b) If rights acquired under subsection (a) above, are or may be prerequisite to the use or application of MCC-developed technology, MCC may also acquire the right to grant sublicenses under such third party technology in connection with licensing MCC-developed technology;

(c) Except as otherwise agreed between MCC and a shareholder, no shareholder shall be obligated to provide rights to MCC under any of that shareholder's technology;

(d) MCC shall (i) provide on a continuing basis for the execution [by each of its or any shareholder's employees who may be engaged in technical activities with respect to a Technology Program] of an employee invention and confidentiality agreement assigning all rights in inventions to MCC, (ii) file patent applications on patentable inventions as soon as practicable and (iii) retain title to all inventions, patents, certificates of utility and utility models, copyrights, and/or know-how, for the convenience of the Technology Program participants, who are the beneficial owners thereof;

(e) MCC shall identify in its periodic reports to Technology Program participants the existence (and, if other than the date of such report, the effective date) of any licensable technology;

(f) Technology Program participants shall be entitled to non-exclusive, non-transferable, royalty-bearing (subject to a period of royalty-free use as provided in subsection [h], below) licenses under MCC inventions, patents, copyrights and know-how associated with the Technology Program;

(g) Rights under any patents, copyrights and know-how, and their associated royalties, shall be stated separately in any license agreement;

(h) Technology Program participants may be rewarded in a manner which bears an equitable relationship to the risks assumed and resources expended. Rewards shall include:

(i) Exclusive access to the technology for up to three (3) years;

(ii) Royalty free use in an amount equal to three (3) times the resources contributed to the Technology Program by the participant (after which royalties will be due); and

(iii) A pro rata share of royalties collected.

(i) No later than three (3) years after MCC determines it has licensable technology (e.g., a demonstrable operability for the purpose intended), MCC must be authorized to and in fact make licenses available to nonparticipant shareholders, and, at the discretion of the Board of Directors, may make licenses available to third parties, subject to any limitations imposed by U.S. law;

(j) The terms and conditions of all licenses shall be proposed by a majority of the Technology Program participants, and must be reasonable, fair, and non-discriminatory in light of the risks assumed by such participants. Such terms and conditions are subject to the review of the Board of Directors, a three-fourths majority of which can require changes. A majority of the participants must approve any such changes; if not so approved, the dispute shall be resolved in accordance with Section 72.

(k) To the extent reasonably practicable, royalties shall be volume or usage based;

(l) MCC shall pay Technology Program participants their pro rata share of royalties collected and each participant shall, in turn, and within thirty (30) days, (i) pay MCC three percent (3%) of any royalties that such participant receives, to cover administrative expenses incurred by MCC in licensing activities and in collecting and distributing royalties and (ii) upon demand by the Board of Directors, pay MCC up to five percent (5%) of any royalties that such participant receives, as an additional cost of the Technology Program to provide incentives to MCC personnel in the Technology Program. Thirty percent (30%) of the remaining royalties received by each such participant (i.e., thirty percent [30%] of at least ninety-two [92%]) shall also be paid to MCC and shall be available to be used by such participant as a credit toward its participation in future MCC technology programs. Such credits may not be used to offset that Participant's costs of participating in any MCC technology programs in existence at the time the credits are earned.

(m) If and to the extent that the participants in a Technology Program jointly determine that technology cooperation with other Technology Programs is desirable, the participants in that Technology Program shall jointly propose the terms and conditions to govern the use of the technologies, and MCC shall grant such rights to the respective Technology Programs (and their participants). The Board of Directors shall establish guidelines and procedures governing the proposal and approval of such technology cooperation.

ARTICLE XI

INTERNATIONAL LIAISON OFFICE

Section 59. Creation and Scope. As soon as practical, the Chief Executive Officer shall establish an International Liaison Office. The activities of the International Liaison Office shall include the following: (a) the acquisition, analysis, evaluation and dissemination of technological information concerning worldwide technology goals, directions and achievements in the fields of microelectronics and computer science; (b) providing information to the government, industry and press concerning MCC's activities; and (c) promoting communication among MCC technology personnel and their counterparts worldwide.

Section 60. Operation. The information gathered and developed by the International Liaison Office shall be made generally available to the shareholders, at a cost (if any) and upon such other terms as the Board of Directors shall determine. Some or all of the services of the International Liaison Office may also be made available to MCC Associates (Article VI), upon such terms as are agreed between MCC and an Associate in accordance with policies determined by the Board of Directors. Expenses in excess of any revenues received from shareholders or Associates for the International Liason Office shall be borne equally by the shareholders, and shall be billed at least annually.

ARTICLE XII

VOLUNTARY WITHDRAWAL OF SHAREHOLDER

Section 61. Right of Voluntary Withdrawal. Any shareholder which has not: (a) committed an act permitting involuntary withdrawal (Article XIII); or (b) failed to meet its Technology Program obligations (Article X), may withdraw from MCC at any time, with or without cause, by providing MCC with written notice and tendering its MCC stock at least one (1) year prior to the intended date of withdrawal.

Department of Justice

I. 9. Justice Dep

RECEIVED
DEC 27 1982
Control Data Corporation
Office of
Government Affairs

FOR IMMEDIATE RELEASE
MONDAY, DECEMBER 27, 1982

AT
202-633-2016

The Department of Justice announced today that it has completed its investigation of the creation of a proposed joint venture to coordinate research projects by companies in the computer and microelectronics businesses, and that it does not intend to challenge the formation of the joint venture.

William F. Baxter, Assistant Attorney General in charge of the Antitrust Division, stated that formation of the joint venture was proposed by officers of Control Data Corporation.

The joint venture will be implemented by offering to U.S. computer and microelectronics companies the opportunity to become shareholders in Microelectronics and Computer Technology Corporation, a corporation set up for the purpose of sponsoring and overseeing research projects to be financed by groups of its shareholders. A number of companies have indicated an interest in becoming shareholders.

Baxter cautioned that the proposed joint venture has the potential either of facilitating new and intensified research efforts or of lessening competition in research, and that the Department's decision not to challenge the formation of the joint venture must not be construed as advance approval of all of its future activities.

An evaluation of the antitrust consequences of the joint venture's future activities, he said, will depend on a number of factors. Among them, he said, are the percentage of the industry that chooses to participate as shareholders in the venture, the identity of the shareholder firms choosing to participate in particular research projects, and whether the costs and risks of particular research projects are of a magnitude that warrants a joint undertaking.

Congressional Research Service
The Library of Congress

Washington, D.C. 20540

October 11, 1983

TO : House Science and Technology Committee
Subcommittee on Investigations and Oversight
Attention: Jerry Ostrov

FROM : Nancy R. Miller NRM
Analyst in Information Science and Technology
Science Policy Research Division

SUBJECT : U.S.-Japanese Shares of World Market for 16K RAM and 64K RAM Semiconductors

In response to your request, enclosed are figures indicating the U.S-Japanese world market shares for 16K RAM and 64K RAM semiconductors from 1978 to the present. Dataquest, a consulting firm in California, supplied the statistics.

U.S.-Japan World Market Shares of 16K RAM

	U.S.	Japan	Total no. unit shipped
1978	64.3%	35.3%	21 million
1979	57.4%	41.4%	72 million
1980	58.2%	40.1%	180 million
1981	59.8%	38.3%	221 million
1982	60.0%	38.0%	260 million
1983	(figures not available for 1983)		

U.S.-Japan World Market Shares of 64K RAM

		U.S.	Japan	Total no. units shipped
	1978	NA	NA	NA
	1979	34.1%	65.9%	36,000
	1980	40.1%	59.9%	441,000
	1981	26.5%	72.5%	13.1 million
	1982	33.2%	66.4%	104 million
June	1983	36.6%	63.3%	134 million
estimate	1983	39.0%	60.0%	350 million

I hope this information is useful to the Subcommittee in its consideration of U.S.-Japan competition in semiconductors. Please contact me at 287-7072 if I can be of additional assistance.

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*ADMITTED N.Y. D.C.

October 14, 1983

Jerome Ostrov, Esq.
House Annex #1
Room 822
300 New Jersey Avenue, S.E.
Washington, D.C. 20515

Re: Committee on Science and Technology --
Review of Legislation Pertaining to
Research Joint Ventures

Dear Mr. Ostrov:

I write to supplement my testimony of June 30, 1983 to call to the attention of the Committee a recent development which, I believe, may further call into question the need for new legislation to encourage joint research projects among U.S. companies.

On September 20, 1983 eight New England high technology firms obtained approval from the Department of Justice to engage in a joint research and development project pursuant to procedures which have long been available under the Small Business Act, 15 U.S.C. §638. Pursuant to this seldom invoked provision of the law, the venture has obtained blanket immunity from antitrust actions predicated upon acts undertaken within the scope of the joint program.

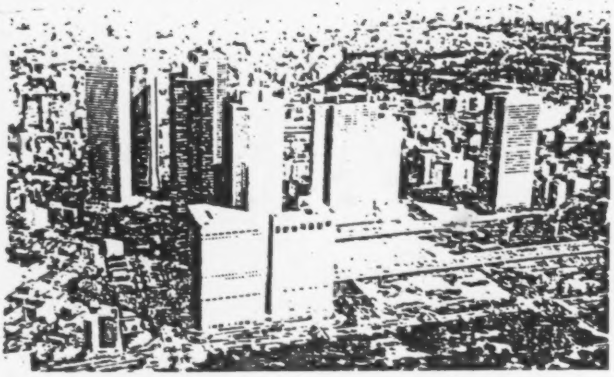
In view of the availability, and apparent viability, of the procedures enumerated in the Small Business Act, I submit that we must question the need for further legislative action in this area. I also respectfully suggest that the proposals currently before your Committee may provide little additional incentive to engage in joint research to any but currently large and dominant firms, who would be unable to seek comfort in the above-cited provision of the Small Business Act.

Once again, I wish to express my appreciation for the opportunity afforded to me to put my comments and observations before the Committee.

Very truly yours,

Alvin M. Stein

AMS/ml



There can be clouds too

Many westerners, awed by Japan's success in coping with two oil shocks and a ghastly recession, view it as a dangerous giant grinding them with its seven-league boots into the dust. Yet, faced with mounting social and economic problems at home, many Japanese see themselves more like struggling athletes, having to run ever harder just to stand still. Nicholas Valéry, our Tokyo correspondent, believes Japan still has enormous potential but that costly reforms will be needed before it can unleash its full creative powers

Tokyo's skyline is surprisingly like Los Angeles's—modern, sprawling and flat. In every direction, the over-riding impression is of a city of two-storey buildings, save for a clump of skyscraper office blocks in the Shinjuku district. Surprisingly, too, much of the Japanese economy is rather sprawling and flat. Just a handful of 50-storey industries (steel, cars, electrical goods and machine tools) account for 74% of Japan's $139 billion of annual exports. The remaining 10 of Japan's 14 key industrial sectors are very two-storeyish indeed—all performing in international trade well below the average for members of the Organisation for Economic Co-operation and Development (OECD).

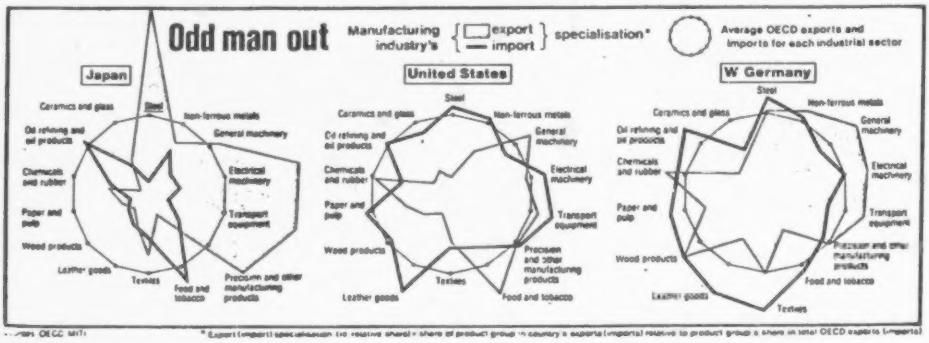
Japan gets it in the neck from the Americans because its export-import pattern is so "spikey" (see chart below). An industrially mature country like West Germany escapes criticism because its exports and imports are "well-rounded", each sector being close to the OECD norm. In American eyes, that makes West Germany a "fair" trader and Japan an "unfair" one.

Which is a bit unfair on Japan. With so many of its industrial sectors (including agriculture, textiles, clothing, chemicals, non-ferrous metals and shipbuilding) wobbly at the knees, Japan has to run faster in those sectors that are fit and well so as to pay for the food, oil, rubber, minerals and so on (worth $132 billion last year) that have to be imported.

Japan has to run faster, too, because the country has so much catching up to do in terms of its social infrastructure. Of necessity, the first three decades of Japan's postwar growth emphasised consumption. The Japanese now have enough to eat, drink, wear, watch, read, ride and play with—though they pay needlessly through the nose for the privilege. In volume terms, they have become almost as rabid consumers as Americans.

In quality terms, however, a considerable gap in life-styles persists between Japan and the west. Japan's infrastructure is little better than a developing country's. Now an impatient population is beginning to demand more spare time to enjoy life, more sports centres to exercise in, more roads to travel along and see places, more sewers to drain away urban dirt and smells, more hospitals, nurseries and old people's homes to care for the sick and frail, and, above all, more luxurious housing for everyone.

There are other reasons why Japan needs to be nimbler on its feet. One is demographic. Its population is ageing faster than any western country's, rendering Japanese labour less productive and far more expensive in the process. It also poses the fear of the country's pension funds becoming insolvent. Another reason is economic. Japan's growth, though



Sources: OECD, MITI

* Export (import) specialisation (ie relative share) = share of product group in country's exports (imports) relative to product group's share in total OECD exports (imports)

consistently better than any other industrial nation's, is down from the annual 11% then 5% gallops of the past two decades to a 3%-4% stroll, with the possibility of slowing to a crawl. And then there is unemployment. Never a problem since the end of the allied occupation, unemployment is beginning to alarm the authorities now that nearly 2m Japanese are on the dole.

The anxiety here is that many people who lost their jobs during the recent shake-out (mostly the middle-aged and middle-skilled) are unlikely to be rehired when the recession is over. Their jobs have been vanishing along with their employers—many to joint-venture shipyards, chemical plants and car factories abroad. The irony is that Japan is going to need lots of quick-witted workers when the future "brain businesses" start clustering around innovations that are taking place in office automation. The disconcerting thing is that today's unemployed will very likely be too old for tomorrow's jobs. So joblessness will rise until the present generation of structurally unemployed "retire" in the 1990s.

And, finally, Japan has to run faster because its exchequer is going broke. Broke? The government is in hock to the tune of $425 billion and is finding it difficult to service the debt, let alone pay it off. Japan is the only industrial country that depends on treasury bonds for more than 30% of its national revenue (government bonds account for 12% of revenue in America, 11% in West Germany and France and under 9% in Britain). Just paying the interest on the deficit-covering bonds that the government has sold over the past eight years will mop up $35 billion of the government's revenue this year—almost as much as it will spend on education, science, national insurance and defence put together.

When he was prime minister, Mr Zenko Suzuki put great political store on weaning the country off its bond-issuing habit. The two policy objectives worked out in 1981 by the blue-ribbon commission he appointed to reform public finances were: to reduce bond issues by $8.5 billion a year, eliminating the need for them by the end of fiscal 1984; and to do so solely by cutting government expenditure. The first objective had to be abandoned before the year was out. Mr Suzuki has now gone and the second of his objectives looks like following suit.

This newspaper has argued before (for example, in the issue of October 23, 1982) that Japan is a country that can afford to run a massive budget deficit. With people saving on average nearly 19% of their incomes, Japan has enough credit lying around to absorb the finance ministry's bond issues without crowding out the borrowing needs of private industry. The OECD pointed out last December that the ratio of government deficit to private savings in Japan was a very modest 13% or so (compared with 20% in the United States, 21% in West Germany and 45% in Italy).

So instead of trying (unsuccessfully) to curtail government bond issues, why not make them easier to sell—that is, direct to the public? The ministry of finance has taken a small step in that direction. Japan's big city banks, which are arm-twisted into taking all the bonds the government wants to dispose of, would be delighted to help. "Ah yes," say spoilsports at the Economic Planning Agency, "but don't you know that the Japanese are saving less and less each year?". Indeed, they are. Daiwa Securities Research Institute expects the savings rate, which was 24% in 1974, to be down to 16.5% next year. Outsiders reckon that is still pretty high.

Previous surveys in this newspaper have examined the Japanese economy in depth, explaining (often with remarkable prophetic insight) how the country will meet, and surmount, the obstacles ahead. This survey attempts nothing so ambitious. It seeks instead merely to explain some of the difficulties that the Japanese face in their daily lives—and why they seem to have to run so much harder than the rest of us.

Japan is a country that is still carrying numerous painful and unsightly scars from its turbulent past. To fail to appreciate the hardships that the Japanese labour under is at once to devalue their achievements and to short-change those who must needs understand and compete with them in the marketplace.

Another generation

The number 76 bus to Tokyo's pulsing Shinjuku shopping district from your correspondent's sleepy suburb comes every three minutes. It is cheap, reliable and crowded—even after most *sararimen* have gone about their daily downtown business. Step on board, pay the 140 yen flat-fare and cast a none-too-optimistic eye around for an empty seat. All are invariably taken by chatting, well-dressed housewives and young office workers, boisterous students and podgy children. The old and infirm have to stand. Welcome to the new Japan.

Japanese values are changing faster than ever. Lost in the process is the ancient Asian concept of the *ie* (extended family) system. The sturdy war-generation that rebuilt the fire-stormed cities, worked long back-breaking hours at the bench, then trooped uncomplainingly home to a near-starvation diet has all but retired. Some 8m Japanese born during the 1947-49 baby boom are now starting to rule the roost, at the office and in the home. They have known both deprivation and prosperity, but so far have had little hand in shaping their country's destiny. They joined their companies in the heady days just before the first oil shock, when economic growth was at its peak. Most staked far greater hopes on their companies than did any generation before or since. Now, like others elsewhere, they complain that their working lives are frustrating and meaningless.

Better things to do than work

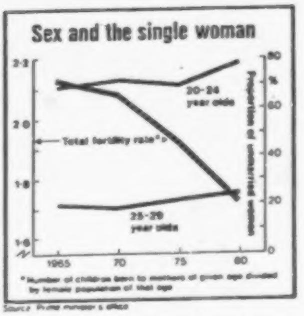
Mr Hitoshi Kato, a gifted commentator in his mid-thirties, wrote recently in *Bungei Shunju* about his generation:

> At school, there were not enough classrooms or teachers for us. Now that we are working, there are not enough positions of responsibility to go round. When we retire, the pension schemes will go bust, and when we die we will have to scramble for a place in the cemetery.

His is a generation that, like the one before, works—and works hard. But it is not with a mission to rebuild a bankrupt country, but more to taste the rich pickings of the new corporate Japan. This is the age group that is demanding the five-day week (only 8% of Japan's 57m strong workforce has a full weekend off), better housing, more generous pensions and greater health care.

Even they, however, are shocked by the cynicism shown by the generatio that has been coming out of the schools and universities over the past five years or so. This is not just adult griping about the youth of today. Where their parents scrimped and saved and rarely took a day off, statistics show that Japan's recen boom in leisure and travel is being fuelle almost exclusively by well-heeled sing men and women and newlyweds. Th believe holidays are there to be taken a that evenings should be spent as far fro the office as possible. The job they sim regard as a meal ticket for the time bei

A survey covering 25,000 young people between the ages of 18 and 24 years in 11 countries put Japanese youth bottom of the list in terms of satisfaction with their family, society and job. Professor Haruo Matsubara, an educational psychologist at Tokyo University who has been responsible for much of the survey work, finds young Japanese people a pretty miserable lot. They were the least happy and hopeful in the survey. American, Swedish and British youth were the happiest.



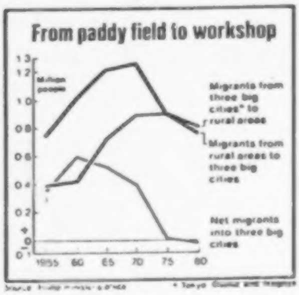
Source: Prime minister's office

Grandparent boom

The Japanese seem to be discarding their admirable Confucian habit of group and filial loyalty with indecent haste. The reasons go deeper than mere westernisation. One cause seems to be the change in family law that took place during the allied occupation, which replaced the old father/son arrangement of inheritance with one ensuring that the surviving spouse (usually the wife) received half the estate. Caring for aged parents has thus become no longer the sole responsibility of the oldest son, but a more diluted obligation for all the family. The result is that more old people have found themselves living alone. Nowadays, nuclear families (that is those with no grandparents living in the home) account for 60% of Japan's 36m households.

Then came the accelerated drift of workers from the paddy fields to the urban factories and shops. Family ties have become stretched. And accommodation problems in the big metropolitan areas of Tokyo, Osaka and Nagoya have made it well nigh impossible for migrant workers to bring aged parents with them.

Modern medicine and better food have compounded the problem, by ensuring that the old live longer. Where parents were once rarely around for more than a few years following retirement, now they frequently live to see their children retire, too. The average lifespan of Japanese people has lengthened remarkably since the end of the second world war, increasing by more than 15 years for men and 17 years for women.



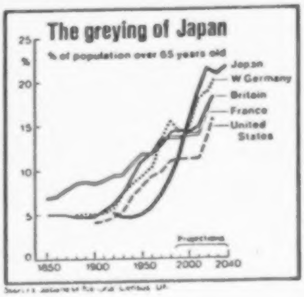
Source: Prime minister's office

* Tokyo, Osaka and Nagoya

Fertility rates have plummeted, too. Increasing prosperity has allowed women to remain in further education far longer and hence stay out of the marriage pool until much older. Prosperity has also made it possible for parents to cease considering children as bread-winners for their old age. By 1981, the average life expectancy was 73.8 years for men and 79.1 years for women, making the Japanese among the longest living people in the world. That said, Japan is at the moment still a youthful nation compared with industrial countries elsewhere. Only 9% of its population is over 65 years of age, compared with 11% in America, 13.8% in France, 14.6% in Britain and 15.3% in West Germany.

A young, healthy population with little demand for pensions and medical care has been Japan's secret industrial weapon over the past three decades. But the country is nowadays greying fast—and with this is coming not only a less vigorous workforce but also bigger social security bills.

Computer models at the Economic Planning Agency (EPA) in Tokyo blurp out a disquietening picture of Japan's demographic future. While it took France 175 years (1790-1965) and West Germany 80 years (1890-1970) for their proportion of over 65-year-olds to rise from 5% to 12%, Japan looks like doing it in 40 years (1950-1990). Around 2025, when the populations of practically all industrial countries will be creaking at the joints, 21% of Japanese will be over 65, compared with 20% of West Germans, 19% of Britons and 16% of Americans.



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For every old-age pensioner in Japan today, seven working people are contributing to pension schemes. By the end of the century, every senior citizen will have to be supported by three-and-a-half workers.

That many geriatric people could well spell bankruptcy for Japan's retirement plans. The country has not been pumping anything like enough cash into its pension funds to cope with the coming grandparent boom. In 1980, for instance, taxes and social security payments collected by the government amounted to 32% of Japan's gnp. Western governments stung workers for much more: from 38% of gnp in the United States to 50% or more in Europe.

Welfare contributions

	Income tax collected % of gnp	Social security collected % of gnp	Total % of gnp
Japan	22.8	9.3	32.1
United States	27.7	10.0	37.7
Britain	38.3	9.7	48.0
West Germany	31.5	19.6	51.1
France	30.8	25.3	56.1
Sweden	45.1	19.0	64.1

Sources: Ministry of health and welfare, Tokyo; OECD

Japan's welfare arrangement is a cross between Sweden's comprehensive state system and France's combination of corporate and private schemes topped up with supplementary benefits from public funds. Any large Japanese firm worth its salt takes care of its employees' health and retirement. Most private insurance plans are far more generous than the government's compulsory scheme. Some 25m people (42% of Japan's official workforce) are covered by company arrangements. Employees contribute 5.3% of their monthly pay, which is matched by an equal amount from the company's coffers.

The 28m workers in the slightly bigger state scheme have to contribute the full 10.6% themselves. To keep the government's pension fund solvent, the EPA estimates that contributions will have to triple, to around 35% of pay, after the turn of the century. Add to that higher medical insurance and Japanese workers could be taking home (Scandinavian-style) less than half their pay.

Such thoughts have been known to keep Japan's economic planners awake at

Life begins at sixty

night. Here is EPA economist Mr Kaoru Yoshikawa's private nightmare:

> First, the assessment of a growing percentage of salary to finance pensions will cause workers' disposable income to level off. Next, since pensions will adequately provide for old-aged people, workers will stop laying aside extra funds for retirement. This will cause their savings rate—and, in turn, the country's savings rate—to shift down. Moreover, the heavy pension burden will generate feelings of unfairness, undermining the will to work.

Should Mr Yoshikawa's fears be realised, the long-term effect for Japan could mean slower economic growth, stagnation in labour productivity and a serious loss of industrial vitality. The obvious answer is to raise the mandatory retirement age (which at present is between 55 and 60 years). Or raise the minimum age of drawing a pension (which is currently set at 60 years). Or both. All easier said than done.

The first solution is bedevilled by Japan's seniority payment system. Older workers, though less productive, have to be paid more. Let them stay even longer on the job and their pensions will become that much more expensive to finance. So, what about raising the pensionable age? Three years ago, the health and welfare ministry proposed a plan to ratchet it up from 60 to 65 by the end of the century. The plan had to be abandoned because of the public outcry. So the government tried instead to trim benefits and get individuals and companies to contribute more. The result: another uproar.

Raise high the roof beam

An uncouth Eurocrat once dismissed the Japanese as "workaholics living in rabbit hutches". Neither point is strictly correct. The average Japanese worker puts in a 42-hour week, then goes home to a house with more rooms than French, Italian or Swedish ones have.

True, Japanese rooms are smaller than western ones. And Japanese houses are huddled close to one another in a way westerners would find disconcerting. But then privacy has never been quite such a priority in Japan as in the west. Where westerners build fortresses to keep prying eyes and the winter cold at bay, Japanese have always preferred open, airy homes that can cope with the summer heat and humidity.

The rooms in a traditional straw-matted Japanese house serve several purposes—as a lounge and dining room during the day and bedrooms at night. Sliding panels and rice-paper *shoji* screens allow the living areas to be enlarged at will. Furniture is kept to a minimum and the *futon* bedding stowed during the day. All very sensible.

Unfortunately, Japanese houses lose their charm and usefulness when cluttered with television sets, dishwashers, three-piece suites and grand pianos. The trend towards western-style housing was well under way even before the "rabbit hutch" remark was made. The jibe, nevertheless, bruised Japanese sensitivities far more than they care to admit—and has made them more determined than ever to overhaul western living standards generally, so as to be able to hurl the insult back.

First, however, two problems have to be solved. One is the cost of housing; the other, the cost of food. Both basically are part of the same problem—space. It is not that Japan's population density of 320 people per square kilometre is so high. Holland and Belgium, both graciously civilised, are even more crowded countries. However, two thirds of Japan is mountainous, which forces the bulk of the country's 118m people to crowd into urban sprawls along the coast.

All told, there are 37m housing units in Japan, with roughly 3.2 people per dwelling. Thanks to the American air force, Japan has few crumbling slums. And the shanty towns of the rapid postwar urbanisation era have long since vanished as landowners realised the value of the plots. House ownership in Japan is the second highest in the world (after the United States); two out of three Japanese live in their own homes.

Building starts, which fell throughout the 1970s, have picked up again. This year, some 1.2m new housing units are expected to be started. The average house being built in Japan today is 20% bigger than it was a decade ago. Offering around 1,000 square feet of floor space, it is about the size of a first-time buyer's house in Britain.

By western standards, house prices in Japan are astronomical. The average three-bedroom dwelling situated an hour and a half from Tokyo now sells for $155,000. Nearly half its cost comes from the price of the land (around $1.5m per acre). Similar houses half an hour from the city centre can cost three times as much. As in other countries, average house prices track the business cycle closely—but at rates 5-8 times average salaries, compared with multiples of 3-5 in Britain and the United States. For that, blame cheap money as much as high land prices.

Bureaucratic good intentions look like sending house prices through the roof. The government wants to make it easier for people to buy their own homes—especially the quarter of the population that lives in rented accommodation. Some of the worst, which really do deserve the "rabbit hutch" label, are the giant public housing developments in Chiba, Tokyo and Osaka offering 2LDK (two living rooms plus a dining/kitchen area) units for families of four.

The state-run Housing Loan Corporation has recently introduced a progressive mortgage scheme with an interest rate that starts at 5.5% then rises to 7.3% after 10 years. Also, in an attempt to stimulate the sluggish economy, tax credits for house buyers have been tripled—to nearly $2,000 annually—for the next three years. Now the government wants the banks and finance corporations to agree to accept mortgage repayments over two generations (father and son), so as to ease the burden further. However, some housing officials fear that if the cost of servicing housing loans is reduced further, house prices will only rise faster in order to mop up the extra income available.

Several things can be done to slow down the growth in house prices. For a start, higher taxes ought to be slapped on pockets of land within cities that are still used (inefficiently) for agricultural purposes. The nationalised railway, JNR, ought to be arm-twisted into disposing of its under-used property. And greater migration ought to be encouraged somehow from the major urban centres.

Unfortunately, one bold attempt to get people to move to the wilderness has come unstuck. The 10-year Hokkaido development plan for turning Japan's green and pleasant northern island into a mecca for the steel and chemical industries has been overtaken by events. Today, the government is helping firms close such plants, not open fresh ones.

The latest official wheeze is to bribe hi-tech companies to build new plants in a score of "technopolis" centres that are to be carved from green fields around Japan. A number of government laboratories have been relocated at the first such centre, Tsukuba academic city, 30 miles north of Tokyo. Tsukuba is to host a world science fair in 1985, but so far has had little success in attracting job-creating manufacturing industry.

Perhaps better still would be to build towns Italian-style. With a similarly mountainous countryside and an equally vociferous farming community hogging the valleys and plains, Italy has been building hill towns successfully for centuries. Given today's standard of earthquake engineering, there is no longer much excuse for Japanese housing to remain huddled, expensively, on the flat.

Nation of shopkeepers

Food takes an even bigger bite out of the *sarariman*'s pay than housing. His family spends 32% of its disposable income at the food stores (housewives in western Europe spend 20% and in the United States 17%). Japanese consumers are penalised because they have far less political clout than Japanese farmers. The drift of rural voters to the towns has left agricultural communities, now more conservative than ever, electorally over-represented by a factor of at least two-to-one. The ruling Liberal Democratic party (LDP), which gets 60% of its support from rural constituencies, is understandably reluctant to upset the farming lobby.

Consumers are beginning to realise, however, that they are paying through the nose for food. Washington's campaign to reduce restrictions on agricultural imports into Japan is bringing the message brutally home. The American administration's bullying of the Tokyo government on beef quotas has focused public attention on the exorbitant price (and poor quality) of meat in Japanese shops. Tough, stringy beef retails in Japan for three times the price of top quality meat in American stores. Famed Kobe steaks cost seven times as much.

Japanese shoppers suspect, too, that life on the farm is a good deal easier than peasant-farmers make out. Government figures show that farming households earn 12.5% more than the average Japanese family. Only 623,000 of the country's 4.7m farming families actually make a living solely from tilling the soil. The rest get most of their income nowadays from non-farm jobs—in nearby factories, construction firms, local government offices and so on. They then collect government handouts for growing rice incompetently in tiny paddy fields in their spare time. The government guarantees them $1,200 a tonne. Australia, new to the rice-growing business, produces it for a seventh the price.

The LDP knows this cannot continue. For one thing, consumerism is on the march. For another, Japan's peasant-farmers are slowly dying of old age. In 1960, their median age was 41; today, it is 52. Most of them will therefore have retired by the end of the century. The government will then be free to tinker with the subsidy and protection arrangements—in order to improve Japanese agriculture and perhaps allow more good, cheap foreign produce into the shops.

That, however, will solve only half the problem. The other half is how to drag Japan's archaic distribution system into the twentieth century. There are close on 1.7m shops in Japan, which is almost the same as in the United States—a country 25 times larger and with twice the population. Only a handful of the 40-odd shops your correspondent passes on his five-minute morning walk to Kagurazaka bus stop employ more than two people. Twenty years ago, small shops like these accounted for 85% of all shopping done in Japan. They declined in numbers somewhat during the 1970s with the growth of neighbourhood supermarkets. Now protected by Miti's 1980 large-store control law, they still account for 75% of Japan's retail business.

Wholesalers are equally numerous in Japan. A three-layered system involving 370,000 wholesalers (again, almost as many as in the United States) adds a 20% mark-up at each stage as goods wind their circuitous way from fields and factories to local stores. With some justification, importers have branded Japan's byzantine distribution system as the ultimate non-tariff barrier. The Tokyo-based Manufactured Imports Promotion Organisation reckons goods are bought and sold four times in Japan before they get into the shop. That compares with 1.9 times in Britain, 1.7 in West Germany, 1.6 in the United States and 1.2 in France.

To call this a distribution system is a misnomer. It is really a welfare system, providing jobs for people after they have retired in their mid-fifties. Putting savings into a small shop or distribution business (usually to handle a former employer's goods) is a favourite way of bolstering a slim pension. And like Japan's non-productive farmers, small retailers and distributors vote solidly conservative. The government is not going to do anything to offend them.

The consumer's best hope lies with the supermarkets, department stores and specialty retailers. Though their expansion plans are strictly controlled nowadays, the giant store-keepers have been finding ways to get round restrictions. Daiei, Japan's largest retailer, has been using its $5 billion worth of buying power to bully its supermarket suppliers into becoming more efficient. Many of the products it now stocks are its own brands.

But, oh, the prices

Department stores, too, have gone on the offensive—with aggressive catalogue-selling and mail-order. Their latest out-of-store sales weapon (inevitably so in the land of the ubiquitous microchip) is what big retailers like to call "electronic shopping". The Isetan chain has led the way by offering customers wired for cable-television the chance to do their shopping from an armchair at home. A telephone call to the local store puts the appropriate piece of sales film on the customer's own television set, along with details of how to complete the purchase (electronically, of course).

Mass merchandisers in Japan like Yodobashi Camera, Laox, Pony and Best Denki are beating the country's tortuous distribution system by ignoring it. Heavy advertising and discounts of 30% on recommended prices give them sales too big (Yodobashi's single store in Shinjuku has a quarter of the Tokyo camera market) for manufacturers to ignore.

A word of warning, however, for visitors to Japan: there are no bargains to take home. Good quality Japanese goods made in efficient Japanese factories finish up (even tax-free and in the cheapest Tokyo discount store) costing as much as they will after being shipped round the world, after having had import duty and taxes levied on them and after being distributed, advertised and displayed in American or European stores.

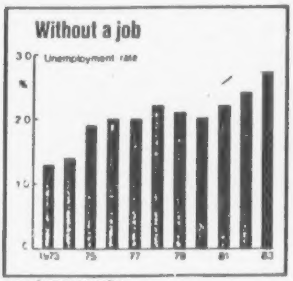
Three of this newspaper's foreign bureaus priced exactly the same product (a Nikon camera) on the same day a couple of months ago. It cost $253 in Tokyo without taxes, but $255 in London and $247 in New York with taxes. And that was for a consumer product where discounters in Japan have broken the stranglehold of the manufacturers and middlemen. Pity, then, the poor Japanese housewife trying to feed and clothe her family.

Hire and fire

All those shops and small firms help keep many otherwise out-of-work people off the streets of Japan. Of the country's 57m registered workers, a shade over 40m work for companies and 10m more are self-employed. Another 6m are termed family workers—giving a hand in their parents' store, noodle shop, paddy field or small workshop. When times are hard, Ma and Pa enterprises help feed lots of extra mouths.

Even they, however, have not been able to mop up Japan's rising unemployment fast enough. The first oil shock pushed Japan's unemployment rate up to 2%, where it bobbed around for the rest of the 1970s. By western standards that sounds remarkably low, but even that has been a source of anxiety in a country used to no more than half that unemployment. Now, with the recession, it has climbed to almost 3%—which, in human terms, means that close on 2m people are now without jobs in Japan.

One way to get through the day



Without a job

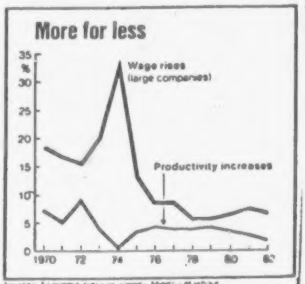
And that is using the Japanese ministry of labour's definition of joblessness. School-leavers and graduates waiting to find jobs are not included in the country's unemployment figures. Nor are people who work, effectively, for one hour or more in the last week of any month—let alone those helping out occasionally on the farm or in the family firm. Opposition politicians say that Japanese unemployment would be twice its present level (that is, 5-6%) if it were calculated according to the American definition. That may be stretching a point a little, but it is nevertheless true that some 8m women in Japan are counted as if they are fully employed but have no regular jobs.

It is true, too, that corporate paternalism has kept many others in employment in Japan who would be out on the streets elsewhere. In 1980, the labour ministry reckoned there were between 2m and 4m people on the payrolls of Japanese firms but effectively without jobs. They were the hidden unemployed. While the country's economic growth surged by 10% or more annually, companies could afford to be compassionate. The humane way of dealing with employees too old or too slow to be retrained was to give them a uniform and tell them to stand smartly in reception.

No longer. The recession has been forcing companies to offload much of their surplus labour. Those companies that are parts of bigger trading blocks have been able to move many of their unwanted workers to expanding parts of the group. Others have been steadily buying their middle-aged workers out with golden handshakes. Hitachi, Japan's top electrical equipment maker, is said to have axed 11,000 jobs from its once 88,000-strong payroll. So much for lifetime employment.

Actually, the Japanese system of lifetime employment applies to fewer than one in three people with regular jobs—that is, about 13m workers in big blue-chip firms. Some 28m more who work for smaller companies can be hired and fired at will. And it is these people who have been squeezed the most by the current recession. Many work for enterprises doing business solely on the sluggish home market. Others are employed by firms involved in sub-contract work for bigger manufacturers, who take the work back in-house when times are hard. The motor manufacturers, Toyota and Nissan, are cases in point. Both have weathered the economic storm remarkably well, but a number of their component suppliers are listing alarmingly.

These problems are not simply going to disappear with the end of the recession. For one thing, a good deal of Japan's investment in new plant and machinery has been going off-shore lately. In the motor industry, the threat of "domestic content" legislation abroad is forcing Japanese car makers to assemble vehicles in their export markets, using a large proportion of locally made components. The same is true for Japan's consumer electronics firms. To that add the growing anxiety among the ranks of top-notch



More for less

firms in heavy industry. The steelmakers, shipbuilders and chemical companies which led Japan's postwar industrial assault on the world are now in retreat.

So much so that they have taken the shine off Japanese productivity. Once the envy of the world, labour productivity in Japan was up only 1.6% last year—the smallest annual increase since the first oil shock rocked Japan. Meanwhile, wages rose by 7%.

What bothers Japan's labour ministry is not so much the sluggish growth in productivity, but the gap that is opening up between various sectors of the economy. Productivity in the manufacturing sector as a whole advanced about 1.5% last year. That, however, masked variations as wide as a 7.9% increase for electrical machinery to a 0.1% fall for steel and a 5.1% drop in productivity among petrochemical firms.

The writing is on the wall: industries with such declining productivity will only drag the economy down if something is not done about them soon.

Planning for obsolescence

At least Japan has an industrial policy of sorts for dealing with the dead and dying parts of its economy. It is trying to manage, in a reasonably humane way, the same chaotic processes which in the United States have precipitated the collapse of grimy old businesses in the industrial north-east and the haphazard drift to the sunbelt and which in Britain, France, Italy and elsewhere have caused untold billions of public money to be shovelled into low-value industries that countries aspiring to per capita incomes of $10,000 or more have no business to be in.

Japan's dirigisme may be no more successful in the long run than America's free-for-all or Europe's muddle. But to criticise—rather than applaud—the Japanese for trying (as western politicians seem quick to do) smacks suspiciously of xenophobia.

Not that Miti is getting all its own way with its policy for "sundown" industries. Powerful forces are ranged against it—especially the country's Fair Trade Commission (FTC). Miti officials want to extend their 1978 law allowing depressed industries to form temporary cartels while they axe unwanted capacity. That law is due to expire this summer.

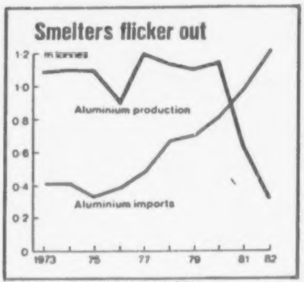
The FTC is fighting Miti every centimetre of the way. It is supposed to be Japan's anti-monopoly watchdog, but can be every bit as interventionist as Miti when it wants. But right now the FTC feels that any further measures to intervene in the Japanese market will only fuel protectionist arguments in Washington. And, of course, the FTC just does not believe that cartels, temporary or otherwise, are the best medicament for crotchety old firms. It is certainly true that livelier ones with a chance of recovery have had to cut back just as much capacity under the 1978 law as incompetent companies with one foot in the grave. And that, says the FTC, is no way to run an industrial policy.

Miti officials realise that many of the complaints afflicting ailing textile firms, aluminium smelters, ethylene plants, fertiliser producers and shipbuilders are at heart terminal. Japanese shipbuilders have had one "anti-recession" cartel to help them reduce their combined capacity by 35%. It allowed them to compete with ruthlessly efficient yards in South Korea, Singapore and Brazil for a little while. But now they are back needing another cartel. The FTC is still ruminating over whether to approve it.

Japan's aluminium refiners—faced with electricity costs three times higher than their American and Canadian competitors—have been in trouble since the first oil crisis sent energy prices rocketing. Their output has fallen from 1.1m tonnes in 1973 to less than 350,000 tonnes today. And imports have trebled to 1.2m tonnes a year.

Yet, even in 1978, Japan's aluminium refiners still had 1.6m tonnes of smelting capacity. Two scrapping targets (first 530,000 tonnes, then 400,000 tonnes more) have been allowed under the temporary measures law. Both have been implemented—and still Japan's aluminium industry is uncompetitive. "The situation is so acute," say worried Bank of Tokyo officials, "aluminium refining in Japan may essentially come to an end."

Runaway energy prices have crippled Japan's petrochemical industry, too. Ethylene costs over 50 cents a kilogram to produce in Japan, compared with less than 30 cents in North America. Not having access to cheap supplies of natural gas, Japanese producers have to use naphtha instead. Naphtha prices have risen tenfold over the past two decades. Also, Japanese petrochemical companies are too numerous and too small, operating a dozen ethylene crackers between them where there is room for two, maybe three, at most.



Smelters flicker out

Source: Ministry of international trade and industry

In 1981, Japan's 12 ethylene producers totted up $260m in losses. The country's 17 largest vinyl chloride makers lost $215m between them. Its 35 fertiliser firms were $140m in the red. And the five leading aluminium refiners had a combined deficit of $250m. Between them, Japan's basic materials producers have shed 380,000 workers over the past half dozen years. They will probably have to lose that many again before the decade is out.

To Miti this says one thing: basic materials are no longer the locomotives of the economy. So shunt them gently into sidings—to clear the way for the new "sunrise" industries.

On target

If Japan Inc existed it would be a rotten firm. It would have made some terrible investment decisions. Miti in Tokyo is widely credited abroad with being both investment banker and executive board of corporate Japan. It is nothing of the sort. Once, in the dim postwar days, Miti officials even tried to snuff out the country's young motor industry, believing it uncompetitive and a waste of resources. They have been trying ever since to force mergers between Japan's seven not unsuccessful car firms and four truck manufacturers. Japanese businessmen sensibly ignore their bureaucrats when they say silly things.

It is a different matter altogether when official pronouncements happen to coincide with what Japanese companies have likewise decided makes sense. The full power of Japanese consensus then comes into play.

These days, Miti is better at backing winners that major industrial groups have already identified. And its so-called "industrial targeting" that American and European governments are currently blaming (along with last year's popular excuses—the weak yen and other non-tariff barriers) for their trade deficits with Japan results more from the collision of competitive Japanese firms at home, all struggling to dominate the domestic market and anxious not to be left behind, than from any government plan to wipe out foreign competition.

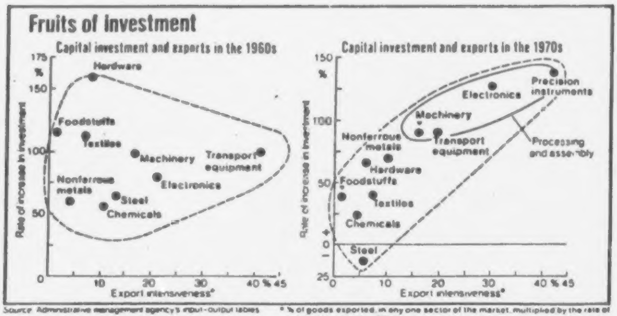
Once a decade, to be sure, Miti's

"industrial structure council"—one of its dozen talking shops for prominent businessmen, trade unionists, academics and journalists—maps out where it thinks the industrial world is heading. However, these "visions" of the future are invariably little more than a bunch of platitudes that pundits everywhere like to trot out. Miti's vision for the 1970s, for instance, concluded that labour costs would continue to rise and so industry would have to become more "knowledge-intensive" to survive. Its vision for the 1980s urges Japanese firms to carry on with the good work, but spend more time doing basic research rather than developing technology from abroad. In short, be more creative.

Foreign competitors exaggerate the importance of Miti in shaping Japan's industrial future. But they underestimate the role played by public monopolies like NTT, the telephone corporation, in nurturing domestic suppliers with preferential contracts and technical help. With the biggest—and certainly the best—research laboratories in Japan, NTT develops most of the really advanced microcircuits it needs for its telephone exchanges. The country's half dozen major semiconductor makers are reckoned to have received more knowhow for producing big microchips informally from NTT than they did under Miti's famous $130m VLSI (very large scale integration) support programme.

All told, NTT buys over $3 billion of new electronic equipment a year, almost exclusively from Japanese firms. American communications companies, with often technologically better and cheaper equipment for sale, have been citing this as an example of the closed nature of the Japanese market. Two years ago, Tokyo bowed to pressure from Washington and signed a three-year procurement agreement with the Americans. NTT now claims to place its contracts on a wholly non-discriminatory basis and gives examples of foreign purchases to prove it—such as the $9m contract with Motorola for radio pagers and Paradyne Corporation's $2m deal for modems. The Americans are not amused.

Japan's other state monopolies practise similar forms of protectionism. American tobacco brands have only 1.4% of Japan's $10 billion-a-year cigarette market, compared with 20-30% in most other countries they sell in. Japan's national tobacco and salt corporation, which manufactures all the domestic brands as well as distributing all imported ones, makes sure that foreign cigarettes are difficult to buy. Sordid little tricks like these are not part of a concerted government plan to keep imports that threaten to swamp any particular market firmly out of Japan; nevertheless, Miti and other government agencies, the Fair Trade Commission included, cheerfully condone them.

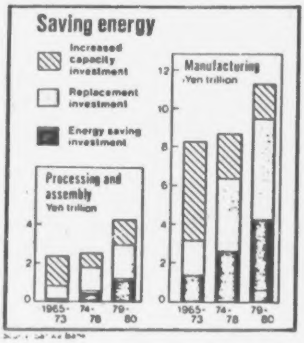


Source: Administrative management agency's input-output tables

* % of goods exported in any one sector of the market, multiplied by the rate of increase in exports of these

Though they move with the tide of opinion, Japan's major manufacturers are laws largely unto themselves—especially when it comes to investment. Firms capitalised at less than $5m and with fewer than 300 employees get 65% of the cash for investment from outside. Official sources like the Japan Development Bank and the Smaller Business Finance Corporation play a guiding role, sanctioning low-interest loans for new plant and technology approved by Miti. Not so Japan's bigger companies, who raise 72% of their investment funds internally.

The structural changes that are chewing their way through big industry in Japan are altering the pattern of investment, too. In a response to slower growth and higher fuel costs, most of Japan's biggest manufacturers and assembly firms in the mid-1970s robbed their investment kitties for replacing ageing equipment and expanding capacity in order to buy new energy-saving plant instead. They did the same again after the second oil shock in 1979.



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Not surprisingly, firms that got their investment timing right were in a strong position when the world started clamouring for compact cars, numerically controlled tools and other energy-saving machinery needed for streamlining creaking production lines. The demand then fuelled additional investment (this time to increase output) back in Japan. A virtuous cycle indeed.

It is this, rather than any carefully aimed "industrial targeting" policy on Miti's part, that has been largely responsible for the surge in Japanese exports that has been sweeping across America and Europe lately. And it is private investment by Japan's independently minded big companies that is changing the profile of the country's exports, increasing their added-value in the process.

In the 1960s, Japan's investment-export graph was roughly pear-shaped and led by motor cars (see chart above). In the 1970s, it became banana-like, with precision instruments pointing the way. In the 1980s? Probably more like rhubarb tipped with electronics.

Challenging the Yankees

Electronics is a good example of the strengths and weaknesses of technology in Japan. It has taken Japanese semiconductor firms, for instance, less than five years to master the American technology for making the big microchips needed in modern computers. Today, they have 70% of the world market for the hottest of new semiconductor products—the 64k ram (random-access memory) chip. Japan's prowess in production engineering has squeezed all the bugs and spare cents out of its designs. In microelectronics, Japanese newspapers would have you believe, Japan has taken on America and won.

The other side of the coin is that

memory chips like 64k rams represent the cheap end of the business—subject to fierce competition, high volumes, slim profits and rapid obsolescence. American semiconductor firms dominate all the more profitable parts of the business where ingenuity and really tricky technology are needed. As a senior director of Sharp Corporation in Osaka, Mr Atsushi Asada, wryly notes: "Japan is powerful in only one sub-field of a single application of semiconductors tied to a specific line of products."

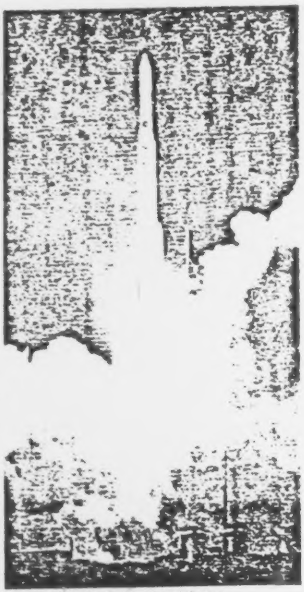
Two views are popular in Japan about the calibre of the country's technology. One says it has caught up on American technology and is now challenging Yankee supremacy in its last remaining stronghold—and that really is the cause of all the trade grievances that Washington has lately been having with Tokyo. The other holds that, in all areas other than production engineering, Japanese technology has become more dependent on western knowhow than ever. There is some truth in both these views. The question is: can Japanese companies carry on taking half-baked foreign ideas and turn them into good, cheap, desirable products? Or has the time come when licensors abroad literally have no more patents to sell or have become reluctant to do so?

First, some figures. In the 1960s, when Japanese businessmen were scouring the world for ideas to copy, the country had a technological import-export ratio of 40 to one. By 1975, the ratio was down to 4.4 to one. Japan remains a net importer of foreign technology—but only because many old contracts are still in force. Japan's technological balance of payments has actually been in the black for a decade now. In 1981, Japan exported 2.8 times more licences and patents ($320m) than it imported ($115m). That said, Japan still buys its technology in the west (80% from America, West Germany and Britain) and sells its knowhow largely to the developing world.

Such success does not come cheaply. Since the mid-1970s, Japan has been spending more on research and development (R and D) than any other country save the United States and Russia. One in eight researchers in the world nowadays is Japanese. Last year, Japan invested $24 billion in R and D—a healthy 2.4% of the country's $1 trillion gnp (America spends 2.3%, Britain 2.2% and France 1.8% of gnp).

More interesting still, growth in R and D spending in Japan has been rising, in real terms, by 10% a year. Also, keen-eyed westerners note, industry in Japan accounts for two thirds of the research done in the country's laboratories (as it does in other countries) but only in Japan does the private sector pay for all its own R and D. Industry in America gets 35% of its research money from the government; in Britain 30%. Research projects in Japanese companies, coming as they do purely out of profits, are aimed directly at the marketplace and are expected to pay their way quickly.

This knack of being able to churn out new products with bewildering speed stems in part from the ease with which technical information is disseminated within Japanese companies. With their "bottom-up" organisation, ideas move in Japanese firms from junior engineers to project managers and on to boardroom directors to become corporate policy. The whole process is helped smoothly along in big blue-chip organisations by the lifetime employment system, where nobody is frightened of losing his job and each gets the credit he is due.



Obsolete before the countdown

But there are subtle differences in the development shop, too. Walk around any hi-tech firm in Japan and what you see is mostly foreign equipment. Practically all those exotic electron beam machines needed for "printing" Japan's famous VLSI microchips are supplied by Itek Corporation in the United States. It seems that when developing a new product Japanese companies buy much of the equipment for making and testing it along with licence—and then zero in on the engineering needed for producing it cheaper and better.

This concentration on "core technologies" is Japan's great strength. It has helped Japanese companies become leading suppliers of VLSI chips, optical fibre communications links, advanced ceramics, composite materials and robots. It ensures that Japanese firms enter the market not only a close second but also with more competitive products.

It is also the key weakness of Japanese innovation. Big western companies (especially American ones) tend to develop for themselves most of the "peripheral technologies" needed for manufacturing and testing along with the product. This gives them powerful bargaining chips when negotiating cross-licensing deals. Japanese firms that have little but cash to offer in return tend to get last year's knowhow and get stung for it, too.

Especially in defence and aerospace deals. Here Japanese contractors frequently have to accept the American gadgets they want in the form of "black boxes" that must be installed with their seals intact. Even X-raying such equipment (ostensibly to see if any cracks have developed during shipping) is often forbidden. Thus, never learning to make the really difficult parts of their big systems, Japanese firms stay technologically 10 years behind their American rivals.

Japan is building the American "Neartip" homing torpedo under licence, but has to import the weapon's sensitive guidance equipment as a sealed unit. The Americans have no intention of releasing such advanced technology until 1988 at the earliest—when, by Pentagon standards, it will be obsolete.

Rockets have similar problems. Japan has built its own space launcher using cast-off technology bought from the manufacturers of rockets like Thor and Delta, mainstays of America's earlier unmanned space programme. The National Space Development Agency in Tokyo can now place 350 kilogram satellites into commercially useful geosynchronous orbits 22,300 miles up from its space station on Tanegashima island. By 1988, when the agency has developed its own upper-stage motor, 550 kilograms should be possible.

At $450m a year, Japan's launcher project has not been scandalously extravagant. The one snag is that key customers like teleco
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Anything you can make we can make smaller, better, cheaper

Let's be creative

If not in space, at least on the ground Japan has benefited enormously from turning the technical ideas of others into commercial products of its own. So why on earth should Japan now want to wander down the lonely path of pioneering new technology itself?

For three reasons, the late Richard Casement argued in these columns just over a year ago (in the issue of June 19, 1982):

- **Pride.** To be called mere imitators, after all the effort and success, rankles the Japanese sorely.
- **Gratitude.** Many senior industrialists genuinely feel that they have learnt so much from the west that now, being able to afford it, they would like to do something in return.
- **Self-interest.** The west's own rate of innovation is slowing down. America and Europe are running out of ideas for Japan to borrow and perfect.

Twelve months of mounting trade friction later, one might add:

- **Fear.** A cantankerous Europe and America could start excluding Japan from future technical agreements.

Western firms are already questioning the wisdom of selling their technical secrets to Japan, only to have Japanese products come boomeranging back on to their own doorsteps faster than expected. Certainly, Japanese newspapers are nowadays full of tales of woe by local businessmen returning from America bemoaning the increasing difficulty of purchasing licences for new products. The end of the carefree days for Japanese firms?

Mr Masanori Moritani, a senior analyst at Nomura Research Institute, argues that there are five stages in Japan's technological development (as shown in the accompanying table). Japanese industry, he says, had reached the first stage by the early 1960s—mass producing motor cars, installing big LD blast furnaces, building oil tankers and making television sets. By the early 1970s, it had mastered the second-stage techniques for manufacturing such consumer electronics products as calculators, colour televisions and hi-fi. Now well into its third stage of technological development, Japan has already stolen leads in the VLSI and robotics businesses and is challenging western supremacy elsewhere.

All three stages so far have involved "incremental engineering"—refining existing designs by making them smaller, lighter, faster, cheaper. Today's microchips like 64k rams are little more than yesterday's 16k rams, but with finer interconnecting lines to allow four times as many memory cells to be crammed in. Japanese engineers excel at refining things.

Five stages of technological development

1	Refinement technologies for existing products and processes	Smaller and slimmer television sets, mass production of cars, larger tankers, LC blast furnaces
2	Applied technologies for new products	Calculators, autofocus cameras, synthetic leather, NC machine tools, synthetic detergents
3	Advanced technologies	VLSI microchips, fibre optics, intelligent robots, amorphous materials, fine ceramics, functional polymers
4	Future technologies	Josephson junctions, three-dimensional circuits, bioreactors, recombinant DNA, nuclear fusion
5	Nobel inventions and discoveries	Transistors, Josephson junctions, lasers

Source: Mr Masanori Moritani, Nomura Research Institute

But the skills they will need for fourth-stage technology look different. Quantum leaps in thinking are going to be called for. Several of the technologies of the 1990s (for example, enzyme-based bioreactions, genetic recombination and nuclear fusion) will also require profound understanding of chemical processes of one sort or another. Unfortunately, Japan is not very good at chemical engineering—perhaps because this is a discipline where innovations tend to come, not routinely to order, but as a series of mental leaps and bounds.

The technologies of the 1990s will also be a good deal riskier. A research team could easily spend upwards of $500m building what looked on paper like a winning design for a fusion reactor—only to find its hot plasma fuel became so unstable as to render the machine radioactively too hot to handle. Western laboratories are littered with such costly failures.

Of course, American and European engineers do not like taking technological risks any more than Japanese engineers. But their failures are never considered wholly wasted. Good researchers try to learn almost as much from their mistakes as from their successes; and they try to minimise the risks involved.

Japan has had only four Nobel laureates. Dr Leo Esaki is one. Having long worked in the United States, where he is one of IBM's most prized researchers, Dr Esaki has had daily experience of how the innovation process works within a creative American company. He concludes that westerners are driven by a set of principles that his countrymen find frankly puzzling—and that this philosophical underpinning supports much of western culture, including science as well as literature and religion. Perhaps, muses Dr Esaki, this is why:

> Westerners don't pounce on any novelty and rush to put out their own version. In the United States, before research and development gets under way, the organisers always develop an underlying strategy on which to base their work. The Japanese are less inclined to bother with such preliminaries. Their way of thinking is different.

If this is indeed the key to creative innovation, how are the Japanese to reshape their mental archipelago? First, clearly, by doing a good deal more tinkering in the laboratory. There is nothing magical about basic research. Scientists working on the frontiers of knowledge usually have little more to guide them than a few theoretical clues and a gleam in the eye. The job is 99% perspiration and 1% inspiration.

Nor is it solely a western prerogative. Some of the most profound contributions to modern physics and cosmology have sprung from the fertile minds of Indian, Pakistani and Chinese scientists. Essentially all that is needed is a steady stream of well-trained brains and well-endowed facilities.

Japan has both. It used to lavish princely sums on its research scientists. Over 30% of the country's total R end D expenditure went to basic researchers in the mid-1960s. A decade later they were receiving less than 20% of Japan's expenditure on R and D. Today they get only 13%. That could change if the government is serious about the Creative Scientific and Technological Promotion Programme it launched two years ago. This aims to inject public money ($45m has been promised) into specific areas of basic research where Japanese scientists have the chance of becoming internationally competitive—as in advanced materials, crystallography and super-fine particles.

There are two further things that Japan needs to do if it is to unleash its full creative power. One is to revitalise its universities, which have become mere mass-producers of diligent but dull engineers and competent administrators. Western innovation owes much to the unfettered thinking that is done around the campuses. The seeds of university science become the tools of technology for tomorrow. Universities in Europe and America tend to be long-range research centres rather than mere teaching factories.

The other thing Japan needs to do is to open its doors more to foreign researchers. America's technological supremacy only came after absorbing Europe's best scientific talent as it fled from Fascism or, later, brain-drained from a weary Britain. Japan would be far better off scouring the world with pocketfuls of cash, not for enticing western firms to part with their patents, but as transfer fees to lure away their top scientists.

What makes Yoshio run? More than anything, the knowledge that time is running out. Time is running out at home, where pressure is building up in the household, on the job and among the old for a better social deal. It is running out in industry, where the new information technologies have to be ushered in quickly before any more disruption occurs within the country's creaking heavy industries. And it is running out abroad, where the rules of the technological race are being rewritten. All this readjustment has to be done within an employment system that has precious little room for manoeuvre, and where the national investment in the social infrastructure has so far been minuscule.

Fortunately, Japan still has an ace up its sleeve that most other industrial countries played long ago—its 60m women.

The better half

The next time you are in a Japanese company, count the number of women working there. The answer is surprisingly high: two out of five is the national average. That puts Japan's female employment on a par with enlightened Sweden's. Next, count the number of women over 25 or so. The answer is surprisingly few.

Japan wastes one of its greatest assets by clinging to feudal notions about the role of married women. They are still expected to behave rather like their grandmothers. Before the war, the average Japanese woman had five or six children, spent the day washing, cleaning and preparing food, then died before her fiftieth birthday.

Young Japanese women nowadays marry around 24 and have two children by the age of 27, then live surrounded by labour-saving gadgets galore to the ripe old age of 79. With her youngest child off her hands before she is 40, the modern Japanese woman has 40 years or more of boredom ahead of her.

Younger women are in hardly any better position. Employers say they are reluctant to train and pay them properly because they leave in droves after three or four years to get married and have children; most do not return after marriage because they find their jobs so dull end unrewarding. Bright young female graduates are paid a third less than comparable males, and may be delegated to making the tea and running errands. Yet among any mixed crop of school-leavers and graduates joining companies in Japan, the girls score consistently higher marks than the boys. That is because the male elite has been creamed off already by the civil service and other prestigious employers.

Both young Japanese women straight out of college and middle-aged housewives alike suffer from the same masterstroke of male chauvinism: the labour standards law. Amongst other things, this carefully regulates the amount of overtime women can work—the main exceptions being nurses, telephonists, news announcers and bar hostesses. In a country inclined to burning the midnight oil, this pretty well guarantees that women never get more than a rung or two up the executive ladder.

Along with Japan's patriarchal nationality law and compulsory cooking classes for girls at school, these discriminatory employment practices constitute breaches of the UN charter on women's rights. The Japanese delegation to the 1980 Copenhagen convention tried to squirm out of signing the agreement on eliminating all forms of discrimination against women. However, a newspaper campaign back home eventually shamed the government into becoming signatories, though it has refused steadfastly ever since to ratify the UN declaration.

Japan itself is the loser. The country is going to need lots more quick-witted office workers if its new "brain-intensive" businesses are to take over the economic running being surrendered by its flagging heavy industries. Housewives, possibly even working from home, would be ideal for such jobs. And, luckily for Japan, the archipelago is blessed with a swelling pool (15m now, rising to 17m by the end of the century) of well-trained women between the ages of 40 and 60.

Women in this age group started trickling back to work a decade ago: some 4m Japanese housewives are now back on the job. The vast majority, however, have had to accept employment in shops or small offices that come nowhere near using their skills properly. These people, plus their sisters still in the home, are Japan's hidden reserves.

The parallel with farm workers is striking. In 1960, Japan had 11.5m people working, rather unproductively, on the land; by 1980, the land force had dwindled to 4m. If, over the next two decades, just half of Japan's middle-aged housewives abandon their kitchen sinks for computer terminals, the country will gain as much new productive labour as it did over the previous two decades when farm labourers forsook their paddy fields to become far more productive factory hands. Think what putting its peasants into factory overalls did for Japan's economic growth. Just imagine what a better job educated housewives could do.

Secret weapon?

June 27, 1983

BRIEFING MEMORANDUM

TO: Members of Subcommittee on Investigations and Oversight

FROM: Albert Gore, Jr. Chairman
Subcommittee on Investigations and Oversight

SUBJ: Joint Hearings on Joint Research in Japan and U.S. Industry Responses - June 29 and 30, 1983 (Subcommittee on Investigations and Oversight and Subcommittee on Science, Research and Technology)

I. INTRODUCTION

A. Hearing Objectives

The hearings will focus on recent Japanese Technological advances, particularly those that have benefitted from collective research, and what U.S. industry is doing to organize similar research efforts. The testimony will describe the role of government in Japanese collective research and the importance of national consensus taking in deciding what areas of research to promote. The relationship between technological productivity and factors such as enlightened Japanese management-labor practices will also be considered. The testimony will support questions regarding what we can learn from the Japanese as well as what steps we should be taking, particularly in the area of collective research.

The following excerpt from the letters of invitation sent to the various witnesses summarizes why the hearings are being held and what we hope to learn from them:

> Japan's industrial success is, of course, the product of a number of complex factors not the least of which is a well-educated, homogeneous, and highly motivated workforce. In addition to its energetic workforce, the nation also profits from an enviable system of government-industry cooperation and from a far-sighted managerial system which focuses on long-term returns rather than on short-term profit-taking.
>
> The above notwithstanding, many have pointed to other factors to explain Japan's technological success. Among the factors cited are the array of policy instruments available to Japan's government agencies, particularly MITI (Ministry of International Trade and Industry), in persuading Japanese industry to pursue targeted research according to government plans. Research programs such as the VLSI (very large scale integrated circuit) project are noted as being indicative of the government's ability to orchestrate collective research and to shelter such activity from the nation's antitrust laws.

The goals of the scheduled hearings are three-fold: First, the two Subcommittees wish to obtain a clearer picture of Japanese industrial policy, particularly as applied to new research programs such as the ICOT [Institute for Generation of New Computer Technology] program to develop a "Fifth Generation Computer". Second, the Subcommittees hope to obtain a better awareness of how U.S. industry, through mechanisms such as research joint ventures, can [learn from and] better meet the Japanese technological challenge. Third, both Subcommittees would like to be apprised of any legal obstacles that might dampen or discourage research joint ventures in the U.S.

B. Hearing Organization

Day one of the hearings will focus on industrial policy in Japan and how the U.S. can respond to recent Japanese technological advances. Special attention will be paid to government-supported joint research in Japan and what the U.S. technological community is doing to promote joint research on a scale comparable to the Japanese.

The following witnesses will testify on day one:

- Admiral Bobby Inman, President, MCC (Microelectronic and Computer Technology Corporation)
- Erich Bloch, Vice-President, IBM and Chairman, SRC (Semiconductor Research Corporation)
- Mr. Joji Arai, Director, Japan Productivity Center
- John Lacey, Vice President, Control Data Corporation (CDC)
- Allan I. Mendelowitz, Associate Director, GAO
- Dr. John Zysman, University of California at Berkeley
- Dr. Harvey Brooks, Harvard
- Dr. Edward Feigenbaum, Stanford
- Dr. Robert Cooper, Director, Defense Advanced Research Projects Agency (DARPA)

Day two of the hearings will focus on legal issues associated with the formation of research joint ventures (RJV's) in the U.S. Special emphasis will be placed on the antitrust aspects of RJV's, with witnesses commenting on various legislative proposals to clarify the antitrust laws in support of RJV's. One of these proposals, H.R. 1952

(Synar, Gephardt, et al.), will be the subject of a separate SRT legislative hearing that will take place in July.

The following witnesses will testify on day two:

- William Baxter, Assistant Attorney General for Antitrust
- Ky Ewing, former Deputy Assistant Attorney General for Antitrust
- Dr. D. Bruce Merrifield, Assistant Secretary of Commerce for Productivity, Technology and Innovation
- Dr. Jordan Baruch, former Assistant Secretary of Commerce for Science and Technology
- Dr. James Mathis, Vice President for Engineering and Science, Exxon and Chairman, Chemical Industry Institute of Toxicology (CIIT)
- Douglas Ginzburg, Harvard Law School
- Joseph Brodley, Boston University Law School
- Steven Olson, Assistant General Counsel, CDC
- Alvin Stein, of Parker, Chapin, Flatow & Klimpl (New York)
- Gerald Sobel, of Kaye, Scholer, Fierman, Hays & Handler (New York)

C. Possible Areas of Inquiry

There are a number of broad areas of inquiry which you may wish to pursue during the hearings. Among them are the following six:

(1) To what degree has government sponsored joint research contributed to technological success in Japan? Is it limited to Japan's electronics industry, especially computers and semiconductors? What other factors or practices, e.g., in the management-labor arena, have contributed to Japan's success, and what can we learn from such practices so as to fashion an appropriate U.S. response?

(2) What role does government direction and planning play in Japanese industrial policy? Are Japan's large corporations becoming independent of government direction or does government play a central role in "targeting" the technological direction taken by the country? Assuming that targeting exists, what form does it take today and is it limited to a certain few industries (or segments of industries) such as the electronics industry?

(3) What role does MITI play in the process? Is it monolithic, as some have claimed? Or as others have claimed, does it merely serve as a catalyst to implement policy already

established by national consensus?

(4) Is Japanese joint research the major competitive factor? Or, is the major challenge posed by other facets of Japanese industrial life such as favorable worker management relations, consensus management and a greater willingness to engage in long-term industrial planning?

(5) Assuming that Japanese joint research is a major factor in Japan's economic success, is there a willingness in this country to replicate such a model? Or would American companies oppose the sharing of ideas? Is the joint research model embodied in the Microelectronics and Computer Technology Corporation (MCC) joint venture indicative of a trend toward joint ventures in this country, or does it merely reflect the position of a segment of one industry?

(6) Is there really a need to revise the antitrust laws to promote research joint ventures? Or, are the antitrust statutes merely being used as an excuse for other problems? Would other legislative/policy fixes, such as enhancing tax incentives or improving trade relations, better address the issue? If antitrust law revision is warranted, what form should the revision take?

II. INDUSTRIAL POLICY IN JAPAN

Scholars such as William Ouchi of UCLA make the case that much of Japan's industrial success is attributable to consensus-taking among Japan's major industries coupled with a legal system that supports such interaction [1] and willingness of the part of government, labor, and industry to work toward common goals. Others such as the Semiconductor Industry Association take the view that Japan's success is attributable to massive intervention by Japan's government agencies, especially

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[1] Though the application of U.S. antitrust laws to research joint ventures is discussed in Section VI, this memo does not address the broader question whether Japanese-style consensus taking would be permissible under U.S. antitrust laws.

Presumably, however, under current law, representatives of different industries would not be foreclosed from discussing national industrial policy with one another. Nor would representatives of the same industry be foreclosed from bringing industry positions to the attention of Congress and/or the Administration. See, e.g., the Semiconductor Industry Association's widely-circulated position paper entitled, "The Effect of Government Targeting on World Semiconductor Competition."

The degree to which members of a given industry could (without the presence of cognizant government officials) discuss industrial policy issues among themselves would, therefore, seem to be the major issue. Resolution of this issues not only warrants a careful analysis of the law but, in addition, requires a clear understanding of the level of detail contemplated by the intra-industry discussions.

MITI, into the affairs of favored industries. The following discussion, coupled with later discussions involving MITI's changing role, is an effort to put the issue of Japanese industrial policy into perspective.

A. Japan's Postwar Recovery

Following World War II, Japan found itself severely crippled by its wartime losses. In 1952, Japan regained its independence and, with it, the ability to rebuild its economy. Using foreign exchange earned from sales to the U.S. Military during the Korean War, Japan started its economic climb by emphasizing critical industries. At first, these industries included such mainstays as iron and steel, electric power, coal mining and shipping. Gradually, following the directives of its Occupation-era Economic Planning Agency, Japan moved into other heavy industries such as petrochemicals, automobiles and nuclear power. These industries were stimulated by tax incentives, and protected by regulation of foreign investment and by the imposition of import restraints.

B. The Promotion of Knowledge-intensive Technologies

By the mid 1960's, Japan had achieved most of its postwar redevelopment gains, and was showing a positive position in its balance of payments account. At that time, MITI began to formulate its "visions", or, industrial directions, for the nation. Among other things, the Agency promoted social development such as pollution control, social welfare such as housing and knowledge-intensive enterprise such as electronic and computers.

Japan approached the challenge of developing new technologies by importing know-how and expertise from other parts of the world. Starting with the bottom end of technologies, its engineers copied ideas from others, refined them and worked their way up to the more sophisticated product lines.

As with the earlier generation industries, the newer technologies were benefitted by a number of promotional measures: tax incentives were designed to promote investiment and export; high debt leveraging was made possible by commercial loans which were available at artificially low interest rates; trade barriers, in particular, non-tariff trade barriers, made it difficult for foreign producers to compete with emergent Japanese industries; and loans from the Japanese Development Bank (JDB) were used to promote various industries, especially utilities and shipping (and, later on, electronics).

C. The rise of MITI and the beginning of its changing Character

During the period of the early 1960's, MITI's power was at its greatest. Armed with authority to allocate foreign currency, the agency held considerable power over those companies who were dependent on imported technology. This authority was relinquished in 1964 when Japan was recognized as an economically developed nation by the General Agreement on Tariffs and Trade, and committed to give up its toehold on foreign exchange.

Drawing upon a tradition of government-industry consensus-taking, the agency continued as a central force in Japanese industrial policy. However, as will be seen, its role in recent years has tended to be that of a coordinator or catalyst, rather than that of a director. This notwithstanding, during the 1970's, two laws designed to promote the electronic and machinery industries illustrate the continued role of government in influencing industrial policy.

Under these laws -- referred to as the Kidenho and Kijoho, MITI was given responsibility for guiding industry in collaborative efforts such as the formation of joint ventures, while the Japanese Development Bank (JDB) was authorized to make low interest loans to favored industries. The two laws also provided MITI with authority to approve research joint ventures and exempt the participants from U.S.-type antitrust laws when perceived to be in the public interest.

D. The change of direction promoted by economic reversals during the 1970s

With the advent of high oil prices in the 1970's and the recession that followed, Japan found it necessary to alter some of its policies and reverse the direction of some of its industries. Industries such as the petrochemical industry were hardest hit by the events of the 1970's. Using authority given to it "under depressed industry" legislation, MITI began working with the petrochemical and other industries to cut back or rationalize production to sustainable levels. Among the other industries were those, such as steel, that had become vulnerable to competition from developing nations with large resources and cheap labor.

As Japan's energy and raw-material-intensive industries have been phased down, the country has looked increasingly to new high technology opportunities.

E. MITI's "vision" for the 1980's

As late as the late 1970's, Japanese industry continued to emphasize improving existing technology rather than developing new technologies. In 1980, this phase of Japan's technological cycle came to an end. For, in that year, MITI issued its vision for the 1980's exhorting Japanese industry to build a technology-based nation within ten years, emphasizing such new technologies as high speed computing, robotics, artificial intelligence computers and biotechnology. The most dramatic of these, the "fifth generation computer project" is discussed at a later point.

F. Government support for research and development

Through the various mechanisms previously discribed, e.g., success--conditional loans, the Japanese government has promoted research and development. The major projects are discussed in Sections III(D) and IV of this memo.

In the aggregate, the government share of R&D in Japan (27%) is considerably less than the government's share of research in the U.S. (47%). However, because one-half of U.S. government research is for military purposes as compared to 2% in Japan, the percent of government R&D devoted to commercial purposes is about the same.

Critics of U.S. government research contend that it is diffuse and uncoordinated among the nation's government laboratories. By contrast, especially in electronics, coordination pervades significant aspects of Japanese R&D, either through joint government-industry R&D or through partitioning of government-supported research activities.

The success of Japan's R&D activities is, in part, reflected in the number of U.S. patents that Japanese companies have applied for. During the last decade, Japanese applications increased by 133% (from 6093 in 1970 to 14009 in 1981) while U.S. applications declined by 14% (from 72343 in 1970 to 62404 in 1981). The efficiency underlying its R&D activities is underscored by the fact that Japan's entire budget for civil R&D is only one-half of the amount spent in the U.S. In one major area of U.S.-Japanese technological competition, i.e., supercomputers, the entire Japanese computer community has spent less on R&D than has IBM.

G. What makes Japan tick?

In addition to a highly coordinated and efficient R&D program, the Japanese can look to a number of other factors for their success. In addition to a homogeneous society which is supportive of national goals and responds readily to government signals, Japanese industry is well-integrated and able to use domestic markets as a springboard for export sales.

The "keiretsu" system of interlocking relationships among banks, distributors and manufacturers has contributed to a "buy Japan" attitude. The system links together all phases of the commercial process into highly structured channels of activity that are difficult for outsiders to penetrate. In addition, industries are well organized along categorical as well as regional lines. As a result, the various industry associations are able to communicate their positions to the government effectively and comprehensively. National advisory boards, such as the keidenren--the Japanese equivalent of the U.S. Chamber of Commerce -- represent the nation's major industries and serve to provide government with invaluable input. In turn, government agencies are well-respected and staffed with highly-qualified civil servants.

Consensus-taking -- the phenomena of disparate industry groups, through hard negotiations, agreeing on those areas of industrial activity most in need of government support--makes the jobs of agencies such as MITI much easier and helps to promote good will. On the job site consensus-taking in the form of consensus managment, labor-management committes and worker "quality control circles" gives workers a greater say in production processes and infuses pride in the finished product.

Product quality is further promoted by fierce competition by Japan's leading companies both within and without the nation. In addition, product quality is benefitted by a society which has become increasingly technocratic and scientifically well-educated. Japan graduates 2.3 times more engineers per capita than we do in the U.S.

Engineers in Japan become involved in the production processes -- an increasingly infrequent phenomenon in this country. Through lifetime employment and longer tours of duty in grade, these professionals master the technology of their employers and add measurably to production quality control.

In addition to the younger workers, Japan's senior management, increasingly, has become technologically adept. More than 65 percent of all seats on the boards of Japanese manufacturing companies are occupied by trained engineers. By contrast, 40 percent of the chief executive officers of America's largest corporations were trained in law or finance. Accordingly, corporate problems in this country are frequently viewed as legal or financial, resulting in a tendancy toward such phenomenon as short-term profit taking to impress shareholders. By contrast, problems in Japan tend to be viewed in a more technical light, resulting in a greater tendancy to address such problems through technological change.

H. The role of trade policy in Japan's economic success

1. The U.S. Trade Deficit in high technology goods

Japan is a resource-poor nation. To achieve economic success, it has had to export. Japan exports about $5 billion more in high technology products to the U.S. than it imports. Overall in 1981, the U.S. merchandise deficit was $18 billion with Japan's exports to the u.S. totalling $40 billion and U.S. exports to Japan totalling $22 billion.

To a degree, such gross numbers are in need of clarification. For one thing, while the $40 billion export figure cited above represented 1.9% of Japan's GNP, it only represented 1.3% of the much larger U.S. GNP. In addition, the U.S. figures do not include sales by U.S. oil companies of third-country crude oil to Japan. If included, these sales would have increased use exports to Japan by $21 billion -- an amount that would have had the affect of the completely eliminating the $18 billion trade defecit figures for 1981. Further, overall, the U.S. exports twice as much, worldwide, in high technology goods than it imports.

2. Decreases in U.S. Worldwide High Technology Exports

The above notwithstanding, the U.S. share of worldwide high technology exports has declined markedly over the last two decades while the Japanese share has increased. In 1962, the U.S. share was 30% and the Japanese share was 4%. By 1980, the U.S. share had declined to 22% while the Japanese share had climbed to 12%.

Depending on one's vantage point, a significant part of the u.S.-Japan trade imbalance may be recouped by opening Japan to increased U.S. imports. In theory, at least, by increasing exports to Japan the U.S. can also regain some of its lost share of exports worldwide. This derives from the view that, until now, Jananese companies have been able to develop products domestically without fear of competition. Then, aided by economies of scale and an advanced position on the learning curve, such companies have been able to beat out others who have not had the luxury of a foreign-competition-free market. Were

Japan opened to competiton, the advantage described above would, the theory goes, decrease or go away.

3. Barriers to Trading with Japan

In addition to the endemic barriers posed by (i) "buy Japan" attitudes, (ii) complex distribution systems, (iii) preferential buying by kieretsu members from within their own ranks and (iv) the failure of many companies to carefully ascertain Japanese tastes, other barriers have traditionally dampened exports to Japan. Among these have been cumbersome products certification requirements, a standard setting process that was closed to U.S. producers, lengthy customs procedures and the necessity that a domestic agent shepherd goods through customs. In addition, until 1981, U.S. companies were foreclosed from participating in Japanese goverment procurement, especially from the $3.3 billion per year market represented by Japan's giant telecommunications monopoly, Nippon Telegraph and Telephone (NIT), and from joining in government-sponsored joint research programs.

4. Recent trends in removing the trade barriers

Though Japan has been slow to remove its nontariff trade barriers, considerable progress has taken place in the last year. First, on February 10, 1983, the U.S. and Japanese cabinets approved the recommendations of a U.S.-Japan High Technology Work Group. Among other things, the recommendations establish principles for the following: (i) mutual access by each nation to investment opportunities in high technology industries of the other; (ii) substantial equivalency for each nation to participate in the markets or the other; (iii) elemination of policies that discourage (nonsecurity-related) procurement from foreign firms; and (iv) assurances that foreign firms will have access to government-sponsored R&D programs. The recommendations also include steps for alleviating existing problems and mechanisms for exchanging data.

Second, on May 18, 1983, the Japanese Diet approved legislation amending 16 laws relating to import certification and standards. In particular, the May 18 legislation reversed old laws under which (i) goods had to be certified in Japan for compliance with Japanese law, and (ii) companies had to apply for certification through a Japanese agent. Under the revised law, companies will be allowed to submit the results of tests conducted at home, and will be able to apply directly for approval to market products in Japan, without having to go through an agent. In addition, the new laws establish "transparancy" in standard setting, enabling U.S. companies, for the first time, to participate in the Japanese standard-setting process.

Third, to assuage concern that NTT procurement was still not fully open to U.S. companies, NTT officials recently suggested the possibility or an "affirmative action program" to promote greater U.S. firm participation. Though NTT procurement was opened to U.S. firms in 1981, sales have, thus far been disappointing, i.e., $16 million in 1981 and $48 million in 1982. NTT's announcement offers hope for larger sales. Many U.S. companies are, however, skeptical. Congressman Tim Worth has stated that, for U.S. companies to design complex telecommunications equipment suited to meet the needs of the Japanese market, U.S. companies must be allowed into NTT's advanced planning sessions.

III. MITI: ITS ROLE IN PROMOTING JOINT RESEARCH

A. Overview

Since 1964, when Japan began to liberalize its trade policies, MITI's power has changed. With trade liberalization, MITI was forced to relinquish foreign currency allocation as a major policy instrument. Its authority has since taken the form of "administrative guidance," i.e., the authority to listen, coordinate and persuade, but not to force.

Aided by an Industrial Structure Council made up of academia, industry, consumer groups and labor unions. MITI's decade-long "visions" has set the tone for industrial planning in Japan since the mid-1960's. Its vision of the 1970's galvanized the nation toward knowledge-based industries.

Of the $3.5 billion budget MITI has at its disposal, only a small percent is available for industrial planning. Similarly, of its 12890 employees, only about one-fourth are in policy-making areas. However, its influence on Japanese society is far greater than these numbers indicate. Organized into seven bureaus, MITI's ranks include the cream of Japan's upper-level civil service ranks. The various bureaus are well-informed and work closely with industry in shaping industrial growth.

B. Joint Research Programs

Armed with authority under laws to promote specific industries, MITI has been successful in organizing some of Japan's major corporations into large-scale R&D efforts which, in turn, have brought financial success to the nation. The most successful of these was MITI's VLSI (very large-scale integration) program -- a program, in part, intended to generate a Japanese computer capable of competing with IBM models of the early 1970's.

With money provided in the form of success-conditional ("Hojokin") loans, MITI funding for the research effort amounted to $123 million of the $309 million invested in the research effort by industry and government. One hundred and fifty researchers were lent to the project by the five participating companies. The success of the effort is evidenced by the more than 1000 patents that were developed during the five year life of the project. More significantly, by the end of 1981, Japanese firms held 70% of the world market for the then state-of-the-art 64K RAM microchips and 38% of the market for the better-established 16K RAM microchips. This is to be compared with 1978 when Japan enjoyed only 13% of worldwide sales in microchips and U.S. companies could claim the rest.

Though the success of the VLSI project is unquestioned, certain cautions involving MITI's role are appropriate. First, it is possible that even without the project, Japan would have developed a competitive 64K RAm chip. Officials of NEC (Nippon Electric Corporation), the nation's major semiconductor producer and a VLSI participant, believe that, if left to their own divices, they would have developed a 64K Ram chips, about 6 months to a year beyond the time taken by the MITI consortium. Indeed, even while the company was contributing 30 researchers to the VLSI project, it had 200 assigned to an in-house team doing related work. The company believes that the in-house work was more important than the MITI project.

Second, William Ouchi of UCLA makes the case that, rather than being orchestrated by MITI, the VLSI project was the product of national consensus-taking, and that, before MITI ever decided to fund the project, their were numerous dialogues both within the semiconductor industry and outside of it. Out of these dialogues came the consensus that government time and money on behalf of the semiconductor industry would benefit the nation as a whole. Accordingly, other industries that also may have wished comparable funding stepped back, knowing that, when the time was ripe for them, a similar national consensus would support their position.

The result of the above, asserts Ouchi, is that by the time MITI undertook the project, it was a coordinator of an established national refrendum rather than the dictator of a new direction.

C. MITI's importance and its changing role.

However one views MITI's role, it seems clear that MITI's involvement is extremely useful to a project. MITI involvement sends the right signal. It tells the public and the banking committee that the government thinks a certain project is a good idea and in the best interests of the nation. In the past, Bank of Japan "window guidance" supportive of MITI projects exerted considerable influence on the way the nation's 13 commercial banks lent money.

Nevertheless, the Agency is going through on evolutionary phase. Pursuant to authority granted it by the "Structurally Depressed Industries Law of 1978", MITI is spending considerable time organizing depressed industries into rationalization cartels that apportion production amongst the declining industries' membership. Even here, however, MITI's authority is not unbridled. While it has had success in coordinating cutbacks in the hard-hit petrochemical industry, it has not been early as successful in persuading the nation's smelters to cut back capacity.

In other areas, MITI has also had problems in asserting its point of view. It is known, for example that MITI wanted the auto industry to arrange itself into two companies, both serving only the domestic market. Obviously, this idea did not achieve acceptance, much to the releif of the nation's multiply-successful auto exporters. Today, some companies will not even take government funds, Toyota being cited as one; and a number of companies have achieved a level of sophistication and financial wealth that enables them to act on their own.

Finally, other Japanese agencies operate in ways that restrict MITI's authority and sometimes challenge it. Whereas, once Japan's Fair Trade Commission (FTC) was no more than a paper tiger, it has become more involved in antitrust issues even where MITI has played a coordinating role. In one noteable case, twelve oil producers, acting in the wake of the 1973 oil crisis, met among themselves and consulted with MITI on the issue of setting petroleum prices. Though the court's 1980 decision was ambiguous as to the propriety of MITI's role, it did convict the companies of price fixing inspiring one commentator to say:

> Viewed in terms of the contest between the FTC and MITI over administrative guidance, the decision represents a clear victory for the FTC's point of view.

Also relevant is the relationship between the Ministry of of Finance (MOF) and MITI. MOF plays a significant role in the effectuation of MITI policy. Although the Ministry does not propose projects on funding levels, it can reject a project proposed by MITI or modify funding. In the case of the nation's aircraft industry, MITI and the Ministry of Finance have disagreed about the proper role of government for much of the industry's existance.

D. MITI's role in promoting joint research in the 1980's

The above notwithstanding, as the Nation begins to carry out MITI's "vision" for the 1980's -- a move toward leadership in new technologies, MITI's role as stimulator of the nation's research policy seems secure. In addition to the first phase of the VLSI project discussed above, GAO reports that MITI is financing 45 percent of the Computer Basic Technology Research Association (CBTRA), which is the organizational entity housing the second phase of the VLSI project. Seven of Japan's largest companies are part of the CBTRA effort. GAO also reports that the Japanese government is fully covering all of the projected $100 milion, 10 year costs of a project to develop a high speed computer. The project, known as the "Association for the Development of High Speed Scientific Computers (ADHSSC)" was formed in December 1981 by six companies and has since been commissioned by MITI to do R&D under contract. Finally, in the area of computers and software, the government, under MIT sponsorship, has initiated a 10-year, $400 million government-industry R&D effort to develop a "Fifth Generation" artificial inteligence computer. (The Fifth Generation project is discussed in the next section).

In the other fields, GAO reports projected government expenditures of over $400 million to develop basic technologies for the "next generation" of high technology industries. "The projects will last from 8 to 10 years with a total of 48 private companies and 10 national R&D laboratories participating."

The New York Times reported that MITI had begun a 10-year $128 million reserach effort in the biotechnology field. The Times reported that, "thirteen major companies and private research institutes were chosen to receive the money for joint work in three broad areas of biotechnology: large scale cell growth, recombinant DNA and bioreactors."

In the area of robotics, the Washington Post quoted MITI as announcing "a seven year, $140 million research effort involving 10 private companies to develop "intelligent robots capable of assembling dozens of different products, including on entire automobile."

IV. THE FIFTH GENERATION COMPUTER

Of the various MITI-sponsored joint research projects, the planned Fifth Generation Computer Project has provoked the greatest amount of attention in this country, in part because of its ambitious goals and in part because of the technological and security implications of a non-U.S. entity winning the Fifth Generation Race.

A. What is meant by the term Fifth Generation Computer?

The Fifth Generation Computer is so named because it leapfrogs the current or fourth generation of computer electronics. The fourth generation employs technology called VLSI (very large scale integration) and, while representing a key to the next generation technology, is, nevertheless, based on traditional "von Neumann" computer architecture.

With von Neumann architecture, computers have the potential to become smaller and faster. However, the design still assumes a single processing unit linked to a memory. VLSI technology provides a means of breaking through this architectural logjam by linking up as many as a thousand processors to thousands of memory units. With VLSI, a computer can pursue multiple paths at one time, enabling it to explore promising paths even as it hits upon some dead ends. With such extraordinarily-increased flexibility, machines might be made to execute on a large scale the facile computations that are needed for artificial intelligence or "fifth generation" computation.

B. Expert computer systems

Artificial intelligence is, to a degree, already present in expert computer systems. Expert systems contain memory banks with large amounts of data. The data is complied in such a way as to make it useful to experts such as researchers and physicians. For example, drawing upon massive medical data banks, expert medical systems can help diagnose diseases, once given a patient's symptoms.

To reflect the fact that knowledge is a combination of data and experience, expert systems are programmed with operating rules. These operating rules instruct the computer to draw inferences from relevant data. For example, if the computer calculates that visibility at an airport is less than a certain cieling, it will also conclude that landing under such conditions is hazardous.

Expert systems embody the work of "knowledge engineers" -- persons responsible for ascertaining how experts in the field of interest solve problems. Put differently, these engineers attempt to ascertain how experts bring judgment and good sense to a problem.

Because human problem solving, or the study of ""heuristics" is anything but exact, many problems remain in perfecting expert systems. Among these are the fact that human experts learn from comparing their conclusions to the real world. Where inferences turn out to be wrong in the light of reality, human experts revise their conclusions. To be effective, an expert computer system must be programmed to do the same thing, *i.e.*, "learn" from its mistakes. Further, no matter how comprehensive the operating rules built into an expert system, there will always be exceptions which expert systems will not be able to draw upon. Finally, even where a knowledge engineer is scrupulously consciencious, some part of the expert's approach to problem-solving will escape notice.

C. Japanese plans to create a Fifth Generation Computer

The above problems notwithstanding, the Japanese have embarked upon a major decade-long effort to mesh expert system technology with VLSI technology so as to create an "artificial intelligence" or fifth generation capability. The uses of such a machine would be legion. For example, using the previously noted medical example, once provided with symptoms, an artificial intelligence computer could not only diagnose but also prescribe a program of medication.

The Japanese program for the fifth generation computer is novel in that it represents an effort to move forward in a brand new technology, rather than catch up to existing technologies perfected by other nations. Further, unlike many past, government-involved programs where only a small percentage of the R&D funding was provided by the government, the fifth generation project is one where beter than 50% of the planned $850 million price tag will be absorbed by MITI. Indeed, the current plan is for MITI to expend $450 million in the hope that industry will pay for the rest.

To implement the program, MITI has established an Institute for New Generation Computer Technology (ICOT) and has designated Kazuhiro Fuchi, formerly head of the information science department of the Japanese Electrotechnical Laboratory, as ICOT's director. Fuchi, in turn has recruited 40 of the brightest young (under 35) minds from the eight Japanese corporations that comprise the ICOT consortium. These young scientists will serve for a period of three years before being rotated back to their home companies and replaced by frest, young talent.

D. The U.S. response to ICOT

In the aggregate, the United States can be expected to expend as much over the next ten years as Japan on artificial intelligence computer systems. Nevertheless, Dr. Edward Feigenbaum of Stanford, author of a recent book about the ICOT project, worries that the high priority and careful coordination given the ICOT project may prove more effective than the fragmented R&D that now takes place in U.S. corporate and university laboratories and at the Department of Defense (DOD). To meet the Japanese challenge, Dr. Fiegenbaum recommends that the U.S. commission a "national Center for Knowledge Technology" (NCNT). While initially funded by the government, the Center would be staffed by firms, research laboratories and universities.

At the hearing, Dr. Feigenbaum will discuss the reasons for his NCNT proposal. He will be joined by Dr. Rober S. Cooper, Director of DOD's Defense Advanced Research Projects Agency (DARPA). In recent testimony before the Defense Subcommittee of the House Administrations Committee, Dr. Cooper stated that DARPA would require $50 million in FY 1984 to start a five-year, $500 million project to develop a supercomputer capable of revision, speech and natural language processing. Richard DeLauer, DOD Undersecretary for Research and Engineering, and a strong supporter of joint research, was recently quoted as saying that the proposed DARPA computer would "outperform anything the Japanese develop."

Dr. DeLauer's optomistic statements notwithstanding, many questions remain regarding the DARPA proposal. Among these are: To what degree will DARPA coordinate with (i) joint ventures such as MCC and SRC, and (ii) research at individual corporate laboratories such as those found at IBM and Western Electric? How can duplication of effort be avoided? Even if successful, can DARPA transfer technology to the private sector fast enough to enable U.S. enterprises to compete effectively in the fifth generation race?

The answers to these questions may not only portend the state of our technological well-being over the next decade but also, in Dr. Feigenbaum's estimation, will heavily influence the state of our national defense.

V. RESEARCH JOINT VENTURES IN THE U.S. AS A RESPONSE TO JOINT RESEARCH IN JAPAN

In response to collective research in Japan, industry in this country has begun to generate a U.S. response. This section provides an overview of the two major joint research efforts in the electronics field initiated by U.S. industry. Also summarized is a joint research effort by the u.S. chemical industry aimed at developing an industry-wide data base on the technological characterizes of various chemicals.

Following the above, the last section of the memo considers the legal issues associated with the formation of U.S. research joint ventures.

A. Electronics

1. MCC (Microelectronics and Computer Technology Corporation)

MCC is a for-profit research joint venture with research objectives in four major areas: advanced computer design; computer software technology; integrated circuit packaging (*i.e.*, microchips); and computer-aided design and manufacture (CAD-CAM). MCC is the brainchild of William Norris of Control Data Corporation (CDC) whose senior vice president, John Lacey, will testify at the hearing. Soon to be based in Austin, Texas, MCC's president is Admiral Bobby Inman, former deputy director of the CIA. Admiral Inman will also testify at the hearing.

MCC's membership consists of the following companies:

Advanced Micro Devices, Inc.
Allied Corporation
CDC
Digital Equipment Corporation
Harris Corporation

Honeywell, Inc.
Motorola Inc.
NCR
National Semiconductor Inc
RCA
Sperry Corporation
United Technologies

The consortium's plans call for the expenditure of up to $100 million a year. Because MCC is very new, little has been spent to date.

MCC's work product will be equally available to all of its members. Membership is open to any U.S. firm. Firms must initially contribute $150,000 and agree to work on one major research project for at least three years. Associated membership at a cost of $50,000 is available to those firms where size makes the $150K contribution prohibitive.

MCC will hold title to all knowhow and patents arising from its research projects. However, the technology developed will be made available to co-venturers, under varying terms which will depend on the nature of the project. To provide an incentive to member companies, the various research agreements may provide for exclusive access to technology for up to three years. After this time frame, the technology must be made availabe to any interested person on a reasonable and identical basis.

The MCC proposal was submitted to the Department of Justice (DOJ) under its Business Review procedures. While DOJ announced that it would not oppose the joint venture, it also stated that it could not give advance approval of future MCC activities until they materialized. This uncertainty is known not to sit well with MMC's originator, William Norris. Nor, is the venture pleased about a letter from the San Francisco antitrust law firm of Alioto and Alioto criticizing MCC as being anticompetitive. (Subcommittee staff attempted to reach the Aliato firm for comments; however, our call was not returned.) Due in part to these two circumstances, MCC favors clarification of the antitrust laws to encourage research joint ventures.

A copy of the draft legal memo underlying MCC is attached. Its author, CDC assistant general counsel, Steven Olson, will testify at the hearing. The document is informative not only with regard to MCC but also because it contains a good discussion of the relationship between a antitrust law and research joint ventures.

2. SRC (Semiconductor Research Corporation)

SRC is a non-profit research joint venture organized for the purpose of defining research objectives in the semiconductor industry. In large part, SRC plans to promote the semiconductor industry by encouraging and funding university research. SRC's 1983 budget is approximately $11 million, better than $8 million of which have been distributed to thirty universities.

SRC's literature states that it was formed because competitive companies were reluctant to share research. Among other things, this circumstance, caused unnecessary redundancy. Also states SRC, the state of the economy resulted in a deminution of resources to devote to research.

Through its activities, SRC hopes to develop centers of excellence in the field of semiconductor research and to foster a greater supply of skilled graduate students in the field. In March 1983, SRC's membership was comprised of the following companies:

Advance Micro Devices, Inc.
Control Data Corporation
Digital Equipment Corporation
General Instrument Corporation
Harris Corporation
Honeywell, Inc.
Intel Corporation
IBM Corporation
Monolithic Memories, Inc.
Monsanto Company
Motorola, Inc.
Hewlett-Packard Company
Silicon Systems, Inc.
National Semiconductor Corporation
Westinghouse Electric Corporation

SRC's director is Larry W. Sumney, former director of the Defense Department's Very High Speed Integrated Circuit (VHISIC) program. SRC's Chairman is Erich Bloch, a vice president at IBM. Mr. Bloch will testify at the hearing.

B. Chemicals

CIIT (Chemical Industry Institute of Toxicology)

CIIT is a nonprofit research effort sponsored by the chemical industry. Most of the major chemical companies are members of CIIT. The organization was formed in 1975 for the purpose of compiling, evaluating and distributing research data on the potential toxic hazards of chemicals.

The Institute is governed by four basic principles: (1) its purpose is to conduct basic research on toxicological issues relevant to the industry; (2) membership is open to all companies within the chemical industry; (3) all of the institute's research results are to be published and made available to the public on a reasonable basis; and (4) no competitive advantage is to be gained by Institute membership.

The Institute has its own staff Generally its employees are not drawn from member cooperations. In December 1975, CIIT applied to the Justice Department for a business review letter. In June 1976, the Department advised CIIT that, given the Institute's operating principles, DOJ would not take any enforcement action.

CIIT's current Chairman is James Mathis, vice president for Engineering and Science at Exxon. Dr. Mathis will testify at the hearing.

VI. CLARIFYING U.S. ANTITRUST LAW: IS IT NEEDED TO PROMOTE RESEARCH VENTURES IN THIS COUNTRY

As suggested in the preceding section, MCC supports a clarification of the antitrust laws to shelter it from the possibility of later suit. MCC is not alone. During the 97th and 98th Congresses, a number of bills have been introduced which, if enacted, would "clarify" the antitrust laws to make it clear that research joint ventures do not offend antitrust doctrine. This section considers the rationale behind such legislation, evaluates its strengths and weaknesses and summarizes the various bills that have been proposed.

A. Legal Setting: The cases for and against statutory revision

No statute prohibits research joint ventures. However, if an R&D joint venture is challenged under the antitrust laws,[2] the venture will be subjected to a "rule of reason" analysis to determine whether it is anticompetitive. Under this form of analysis, the procompetitive and general consumer benefit potential of a joint venture (research or otherwise) is weighed against the anticompetitive potential that it poses in the market.

Under a rule of reason assessment, an R&D joint venture could be adjudged anticompetitive because it was being used by the parent organizations as a conduit for otherwise proscribed activities such as pricefixing. Similarly, an R&D joint venture could be viewed as suppressing the emergence of independent research efforts by the members of the venture. If found to be in violation of law, the co-ventures could be held civilly and/or criminally accountable. In addition, if private antitrust suits were filed and damages established, the co-ventures could be subject to a treble damage penalty.

Though the possibility of suit can not be eliminated, no court-decided cases have been brought to the attention of the Subcommittee staff in which a court found an R&D joint venture to be anticompetitive.[3] Further, during the period 1972 to 1980, the Department of Justice (DOJ) expressed enforcement concern in only two of the ten proposed R&D joint ventures submitted to it under the Department's Business Review procedures. Further, since December 1980 when the Department issued its "Antitrust Guide to Research Joint

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[2] The antitrust laws in question are the Sherman Act s 1,2), the Clayton Act s 7 (15 U.S.C. s 18) and the Federal Trade Commission Act s 5 (15 U.S.C. s 45).

[3] In the MVMA case, a court-approved consent decree did prohibit automobile manufacturers from engaging in joint research to develop emission controls. However, the decree (which, of course, is not a court opinion) did not address the legality of research JV's under the antitrust laws. Rather, it reflected the failure of the companies acting in concert with one another to incorporate research advances into the production process. The court recently declined to extend the decree.

Ventures", there has been no instance in which the Department indicated that it would enforce against a proposed R&D joint venture.

In the case of MCC, as noted, the Department reserved judgment on the eventual structure and composition of the MCC group. However, the Department's statement that it did not object to the formation of MCC is consistent with its prior record of restraint in the R&D legal arena.

The above notwithstanding, some lawyers and corporate executives contend that the antitrust laws exert a chilling effect on R&D joint ventures. Two factors are at play with regard to this claim: First, private antitrust suits are costly to defend; second, such suits are extremely intimidating because of the potential of treble damage penalties.

Those who disagree with the proposition that the antitrust laws exert a retardive influence on innovation point to the fact that existing DOJ Business Review procedures enable prospective joint venturers to ascertain in advance the enforcement posture of the Department. Since private antitrust suits often are filed on the coat tails of government suits, it is claimed that a favorable DOJ determination will significantly lessen the likelihood of a private action.

These antitrust proponents acknowledge that a DOJ determination need not block a private suite. However, they note that private suits are on the decline, are extremely expensive to bring and are substantively very risky given the absence of decided case law holding against R&D joint ventures. A frequently-voiced sentiment from such persons is that the antitrust laws are being used as a convenient whipping boy and that, in most instances, competitors choose not to form R&D joint venture because they are disinclined to share their findings and knowhow. While such persons recognize that some revision to the law could be useful, they state that the issue of U.S. technological competitiveness should not be approached solely through the lenses of the antitrust laws. Instead, such an assessment should consider all aspects of the legal framework that effects U.S. competitiveness. Included in such an assessment would be the nation's tax, trade, banking and regulatory laws.

B. Bills that would revise the antitrust laws

Against the above backdrop, five bills have been introduced in the 98th Congress to promote R&D joint ventures by revising the antitrust laws. A sixth bill is being considered by the Administration. The following is a brief synopsis of the bills.

(1) H.R. 1952 (Synar, Gephardt, Wyden and Zschau)

(a) Self-Certification through Notice to DOJ. With one exception, H.R. 1952 does not contemplate a review process by the Federal Government. Instead, the bill's benefits are extended to co-venturers who provide DOJ with notice of their plans to form a research joint venture and whose characteristics satisfy various objective criteria set forth in the bill. DOJ approval is required only in those instances where (i) one of the co-venturers accounts for 25% of the world market for a given product, and (ii) collectively, the co-venturers account for 50% of the worldwide sales for the product.

(b) Management of the Joint Venture (JV). In addition to each co-venturer being represented on the JV's board of directors, there must also be three citizen representatives from academia, nonprofit organizations or other firms.

(c) Access to JV. Any U. S. firm must be allowed to join the JV, conditioned on the establishment of reasonable and uniformly-applied entrance requirements by the JV.

(d) Transfer of Technology to Non-Members. Within 3 years, technologies developed by the JV must be made available to non-members under terms which the citizen members of the JV board consider to be reasonable.

(e) Immunity From Suit. Joint ventures whose activities are within the terms of the statute and who have filed notice are sheltered from antitrust liability.

(f) Attorney's Fees. If suit is brought and the Court determines that a JV was operating within the terms of a properly filed notice, the court must award court costs including attorney's fees to the defendant co-venturer.

(g) DOJ Investigation of a JV. DOJ may, at any time, investigate a JV. If the Department determines that the originally filed notice was deficient or that the JV is not operating in accordance with a properly filed notice, the Department can file suit to have the JV dissolved.

(2) S. 737 (Mathias, Hart, Specter, Baucus and Chafee)

(Same as H.R. 1952)

(3) H.R. 108 (Edwards, Hyde and Mineta)

(a) Certificate of Review Obtained from the Department of Justice. The bill does not provide for self-certification as in H.R. 1952. Instead, the co-venturers must file an application with DOJ requesting a certificate of review. DOJ must act on the application within 60 days. This timeframe may be extended by 30 days if additional information is required.

(b) DOJ May Issue Guidelines. DOJ is authorized to issue guidelines describing those characteristics which, if included in an application, would likely result in a favorable determination.

(c) An Adverse DOJ Determination May Be Challenged in Court

(d) Receipt of a Certificate of Review Shelters Co-Venturers from Criminal Actions and Treble Damages. However, unlike H.R. 1952, a *private antitrust suit may be brought for actual damages* attributable to anticompetitive conduct on the part of the co-venturers.

(e) *Attorneys fees*. As with H.R. 1952, if a JV is operating within the terms of a certificate and if its conduct is not anticompetitive, a reviewing court may award attorneys fees to the JV in the event of an unsuccessful law suit brought against the JV.

(f) *Attorney General may revoke certificate*. If after notice and the opportunity for comment, the Attorney General determines that a JV is not operating within the terms of its certificate, he may revoke the certificate. The action is appealable in court.

(4) S. 1383 (Glenn and Kennedy).

Same as H.R. 108, except certificate of review shelters co-ventures from actual as well as treble damages.

(5) S. 568 (Tsongas)

(a) Co-ventures must obtain approval of DOJ. As with H.R. 108 and S. 737, to obtain the protection against suit provided for in the bill, the research JV must first obtain approval from DOJ. The Department must act within 60 days of the receipt of an application.

(b) Access to JV. For a proposed research JV to be approvable, it must be open to all U.S. firms and domestic subsidiaries of foreign firms. The latter is imapplicable where another country denies similar benefits to U.S. subsidiaries, and the domestic subsidiary's parent is incorporated in such other country.

(c) Technology transfer. Technologies generated by the JV must be made available to nonmember firms within six years of development, under terms that are fair and consistently applied.

(d) A JV which has received DOJ approval is immunized against any antitrust suite arising from activities covered by the DOJ approval.

(e) Attorneys Fees. As with the other bills, if a JV is sued and a court determines that the JV is operating within the terms of a DOJ-approved application, the court may award the JV costs including the cost of attorneys' fees.

(6) H.R. 3393 (Sensenbrenner and Lloyd).

(a) Self-certification through notice to DOJ. As with H.R. 1952, extends coverage of bill's provisions to co-venturers who file notice with DOJ. Notice must assert that requirements set forth in the bill will be satisfied by the joint venture.

(b) Limitations on Joint Ventures accounting for 25 percent or more of market. Only in certain circumstances does the bill cover JV's where co-venturers account for 25 percent or more of world wide market. In such a case, the research must either (i) be of a non-marketable variety; (ii) be likely to increase competition, improve the nation's economy or contribute to national security; or (iii) be related to Federally-imposed environmental requirements. Co-venturers may obtain a ruling from DOJ as to whether a JV representing more than 25 percent of the market satisfies the bill's requirements.

(c) Transfer of Technology to Non-Members. As with H.R. 1952, coventurers may have exclusive access to technology for a period of three years. Thereafter, technology developed by the JV must be made available to the (domestic) public under terms that are reasonable.

(d) Duration of JV. Under the bill, a JV may not exceed fifteen years in duration.

(e) Immunity from treble damages. Though the bill purports to confer antitrust immunity on JV's whose activities are within the terms of the statute, it does state that, in the event suit is brought, a court may award actual, but not treble, damages.

(f) Attorneys fees. As with H.R. 1952 and H.R. 108, a reviewing court may award attorneys fees to a JV which successfully defends against an antitrust suit by showing that it has operated within the terms of the statute.

(7) DOJ Proposal

(a) Rule of reason standard made legislatively applicable to research JV's. Research joint ventures would always be evaluated under the rule of reason standard and never would be regarded as *per se* violating the antitrust laws.

(b) Treble damages inapplicable in rule of reason contexts. By definition, treble damages could never be recovered in a suit brought against a research JV.

APPENDIX III

ADDITIONAL STATEMENT FOR THE RECORD

Technology International, Inc.
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The Honorable Doug Waldren
The Honorable Albert Gore, Jr.
Committee on Science and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Congressmen:

The staff of the Committee on Science and Technology has requested that I provide comments for the record concerning the subject matter covered by your recent hearings on joint research in Japan and industry responses, and I feel privileged to do so.

As my attached biographical statement shows, I spent six years in Japan as the Counselor for Scientific and Technological Affairs in the American Embassy. During this exceptionally long Foreign Service tour, I had an unusual opportunity to study at first hand the operation of the Japanese research and development system, both in the governmental and industrial sectors. You have received testimony from a number of expert witnesses and I will try to avoid plowing old ground by taking advantage of my much different perspective.

A number of myths have grown up about Japanese industrial and commercial successes, due either to a lack of an in-depth knowledge of the Japanese scene, or -- in some cases at least -- because of self-serving reasons. These myths abound in Europe as well as in the United States, so we need not consider them to be peculiarly American. Let me address some of them that are within the purview of your investigation.

Myth No. 1: The Japanese are imitators and are not capable of innovation.

According to Dr. Paul Gray, the President of MIT, the word "innovation" should be construed to mean more than "invention", and to include invention within it. Innovation is then the entire process ranging from invention to the successful marketing or large-scale application of a new product or process. In this sense the Japanese have been remarkable innovators if not inventors. The Japanese capacity to invent also has been widely deprecated, even by many Japanese themselves. I attribute this to several complex factors, including the reluctance in Japan to recognize individual rather than group accomplishment, reliance in the earlier years of the history of Japanese science and technology on publication of scientific results in the Japanese language rather than in international journals, and a great tendency in the postwar years to emphasize applied research and development instead of basic science during Japan's reconstruction. I have discussed the quality of Japanese science with literally hundreds of American scientists and engineers who work directly with their Japanese counterparts in a wide variety of technical fields and almost invariably I have been told that the Japanese are working at or close to the leading edge of these fields. It is true that Japan has not invested as heavily in "big science" as the United States, the Soviet Union, and Western Europe, but this situation is changing also. Increasing recognition of Japanese scientific accomplishments can be demonstrated by the numbers of Japanese elected as foreign associates to the National Academy of Sciences and the National Academy of Engineering.

Myth No. 2: Japanese companies have stolen or otherwise illicitly acquired proprietary industrial technology from the United States, as one secret of their success.

As far as I have been able to determine, there is no evidence to support this contention beyond the few cases that have been publicized. One or the other of two old adages may apply: "Where there is smoke there is fire" or "One swallow does not a summer make." The former is more appealing to those who wish to justify the erection of barriers against the transfer of technology to Japan. What I do know is true is that the Japanese are far more assiduous students of the world technical literature than we are. English is taught as a second language in Japan for a number of reasons, one of which is to facilitate the acquisition of technical knowledge from abroad. Japan has invested untold sums in teaching its population English; I see no such commitment toward any foreign language or languages in the United States.

This myth also fails to take into account the heavy investment made by Japanese industry in acquiring American technology through perfectly legitimate means: by licensing agreements, the payment of patent royalties, and the formation of joint venture companies. The Japanese are pragmatic people generally and they are the least guilty of the NIH (Not Invented Here) Syndrome of any of the major nations. That is, they do not believe in wasting money in reinventing the wheel just for the sake of chauvinism. My contacts with many American corporations who do business in Japan indicate that most of them are pleased with the Japanese relationship, have been compensated adequately for the technology transferred, and that while the Japanese are tough negotiators, they are honest and fair.

To try to put this issue into realistic context, let me quote from a paper given recently by a senior executive of an American microelectronics corporation:

"Major U.S. companies have a practice of buying Japanese equipment for the specific purpose of analyzing its features and the manufacturing techniques used to produce it. In the integrated circuit industry in particular, the technique of reverse engineering is quite common.....For key state-of-the-art components in (this) industry there are companies that specialize in reverse engineering. These companies are used by both the Japanese and the U.S. manufacturers and they are, therefore, a valuable source of information about the industry in general."

In the interest of our overall political, military, economic, and social relationship with our most important ally in the Pacific, I wish we would dwell more on the rule rather than the exception and be very cautious about accusing others of "underhanded" practices that we may engage in ourselves.

Myth No. 3: The Japanese publish their technical findings in their own language, making it extraordinarily difficult for other nations to learn what they are doing.

A few unthinking persons have actually claimed that the Japanese use their language as a built-in trade barrier. Putting this aside, I see nothing intrinsically wrong about Japanese scientists writing in their own language, but the premise of the myth is simply not accurate. Certainly most of the technical literature of Japan is in the indigenous language. According to an exhaustive study made by General Motors Corporation, approximately 25% of the 9100 scientific and technical periodicals published in Japan have texts which are fully or partially in Western languages. Regrettably, only 19% of all of these journals are indexed in the West, adding to the difficulty of acquiring a timely understanding of technical events in Japan. However, there is the other side of the coin. Interest by foreigners in studying the Japanese literature is a recent phenomenon and I have the distinct impression that it is still not common practice in the United States to consult the Japanese literature -- even when it is in English. There are many technical periodicals for general readership published in English in Japan which would quickly lead the interested reader to more specialized journals if he wished. I find very few Americans who know of these periodicals or who use them. To extrapolate perhaps a little further than is justified, even if all of the Japanese technical literature were in English, we have no assurance that it would be studied and used to the same extent that the Western literature is utilized in Japan.

This myth also fails to take into account the significant volume of scientific and technical information acquired from Japan through a broad network of cooperative programs conducted by the U.S. and Japanese governments and through private sector relationships. My general impression, however, is that U.S. industry does not study this information as diligently as it should.

Myth No. 4: MITI orchestrates and targets industrial research and development in Japan in a highly successful and efficient manner, but in a way considered unfair to the United States.

There is no question but that government/industry/labor cooperation is much stronger in Japan than it is here, but it is going too far to think either that this collaboration is uniformly successful or that Japanese industry accepts MITI's guidance without question. We all know the success stories, and logically so. What is not discussed so much are the failures and the problems. I cannot give a catalog of these here, but a few cogent examples may suffice. In the 1960's MITI organized and sponsored the development of a commercial passenger aircraft. The Japanese domestic airlines purchased the plane and a few were sold abroad, but the project failed with the introduction of the smaller class of jet aircraft built in the United States. As a consequence of the development of assembly line techniques for the manufacture of merchant ships, Japan almost captured the world market, only to find that too large a capacity had been installed. The ensuing readjustment that was required was expensive and set back the normal pace of Japan's industrial growth. After the oil shock of 1973, MITI tried to take on the responsibility for all R & D in the energy field other than nuclear energy through its "Project Sunshine". Notwithstanding its preparation of elaborate plans and glossy brochures, MITI could never obtain sufficient funding from the national government to make any significant progress. U.S. spending on non-nuclear energy R & D during the remainder of the decade was at least ten times that of the Japanese. Many of Japan's most spectacular successes in the consumer products field did not benefit from MITI organization or sponsorship of R & D or from R & D performed in MITI's laboratories. Products in this category include automobiles, black-and-white and color television, video cassette recorders, hand-held calculators, and more.

Further elaboration of the myths I have cited may be found in two recent publications to which I direct your subcommittees' attention. The first is the proceedings of a workshop on Japanese scientific and technical information held at MIT this past January. It is available from the National Technical Information Service as Document PB83-179903. The other is a survey article on Japanese industry and technology that appeared in the 9-16 July issue of The Economist.

I do not wish to be considered an apologist for Japan but I do champion the cause of better understanding. What I have tried to demonstrate above is that the Japanese are human. They are not supermen. They work hard and have a sense of national purpose. They make mistakes. We would do well to study the Japanese system and learn from it, but not try to emulate it.

Sincerely,

Justin L. Bloom

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President

Biographic Statement

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Justin L. Bloom was born in Pittsburgh, Pennsylvania, on March 9, 1924. He grew up in Los Angeles and was graduated from the California Institute of Technology, Pasadena, in 1948, with a degree in applied chemistry (cum laude). His schooling was interrupted by three years in the U.S. Army, with service as a combat infantryman in Europe. He carried out undergraduate studies in mechanical engineering at Syracuse University while in the Army.

Mr. Bloom has been employed as a chemical engineer or program manager by Shell Chemical Corporation, Standard Oil Company of California, Lawrence Livermore National Laboratory, and Martin Marietta Corporation. He also spent more than 20 years with the U.S. Government, working for the Atomic Energy Commission as a branch chief in the control of nuclear materials and in the development of applications for radioisotopes and radiation, and as technical assistant to the Chairman of the AEC and other AEC Commissioners. He joined the Department of State in 1973 as the Director of the Office of Nuclear and Energy Technology Affairs, and in 1975 was posted to the American Embassy in Tokyo as the Counselor for Scientific and Technological Affairs. He remained in Japan until July 1981, when he was transferred to the American Embassy in London to occupy the same position. At the time of his retirement from the Foreign Service on March 4, 1983, Mr. Bloom was a member of the Senior Foreign Service and held the personal rank of Minister-Counselor.

During the past two years he has lectured by invitation at the Massachusetts Institute of Technology, The Aspen Institute (Berlin), The London Business School, the Smithsonian Institution, and at a number of other organizations in Europe, the United States and Japan. His specialties are international technology transfer (with emphasis on Japanese and British science and technology), energy research and development, and nuclear policy.

Mr. Bloom is a Fellow of the American Association for the Advancement of Science and a member of the American Institute of Chemical Engineers. He has published many articles in the technical literature and holds three patents. He has received the AEC's Sustained Superior Performance Award and the Department of State's Meritorious Honor Award and Performance Bonus Award.

Among Mr. Bloom's avocations are drawing and painting, classical music, and computer programming. He also has been active in civic groups concerned with care of the mentally retarded. He is married to the former Roslyn Zaleon; they have an adult son.